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LABORATORIES

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THIRD ANNUAL REPORT
OF
THE SUPERINTENDENT OF THE
BUREAU OF GOVERNMENT
LABORATORIES

FOR THE PERIOD FROM
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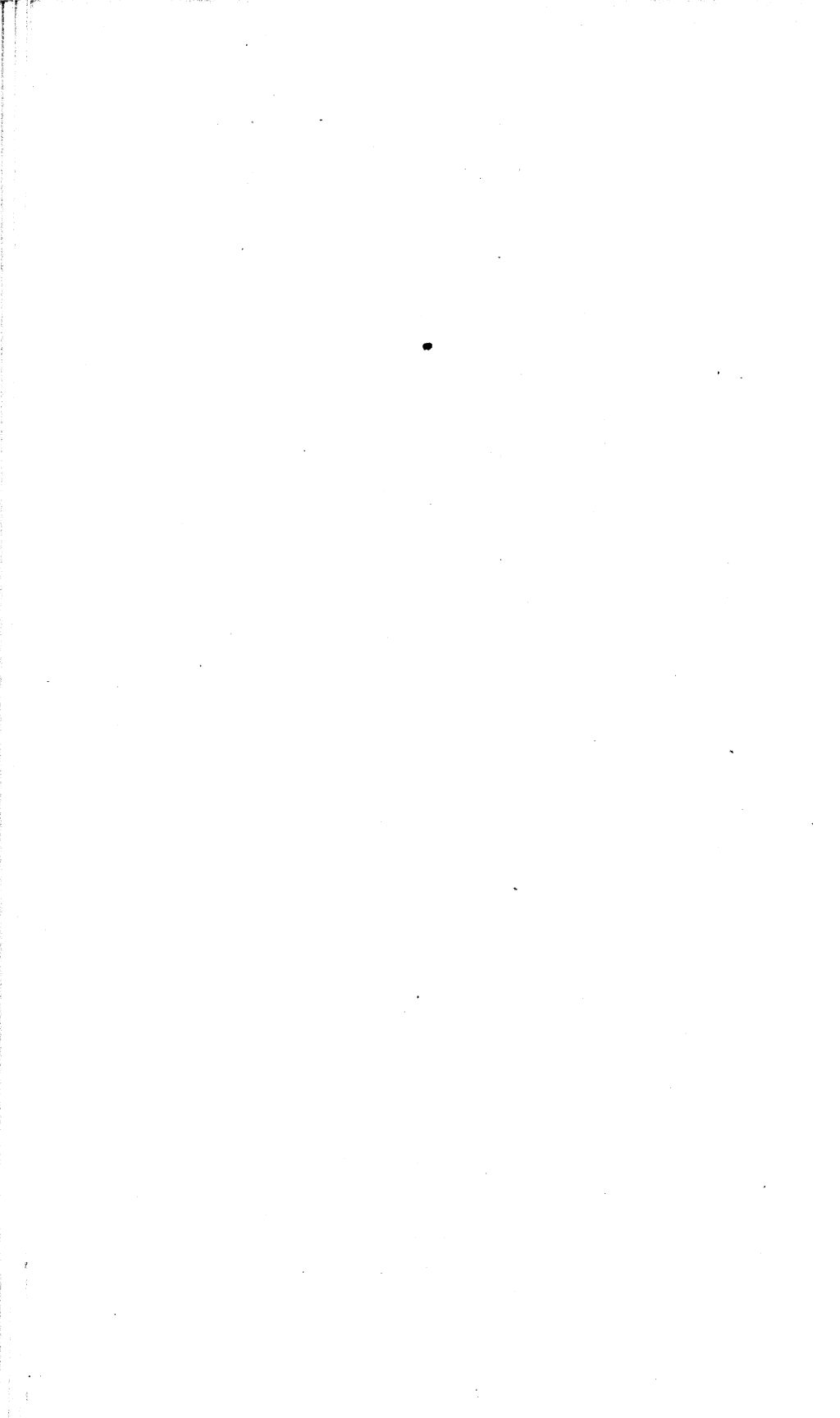


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THIRD ANNUAL REPORT OF THE SUPERINTENDENT OF GOVERNMENT LABORATORIES.

DEPARTMENT OF THE INTERIOR,
BUREAU OF GOVERNMENT LABORATORIES,

Manila, September 15, 1904.

SIR: With the completion of the new buildings the Bureau of Laboratories will enter on the second era of its existence. Heretofore it has not been able to cover the ground which it wished, and it has not been possible, excepting in a limited degree, to give facilities to persons from abroad who desire to complete scientific studies in the Philippines. However, with the changed conditions this disability will be removed, and from now on the Bureau will be in a position to carry out one of its original plans of providing workrooms and appliances for investigators coming to the Philippine Islands from other countries. The value of such a course will be found not only in the general scientific advance of the world but it also will be evident in the educational advantages which will be afforded the people of the Philippine Islands. It would not be possible for extended periods to receive scientific men of high standing among us without having persons not in any way connected with the Government or with the laboratory force acquire a knowledge of the results achieved which would be of lasting benefit to them.

The Government has supported the laboratories to the very best of its ability. It has given all the necessary apparatus and supplies and has provided a structure which would be a credit to countries of larger wealth and resources. However, as it is with all other institutions of the character of this one, the funds immediately at hand are never adequate to accomplish all that is desired, and further development will mean further financial support. It does not seem unlikely that the aims of the laboratories would appeal to persons who have in the past felt inclined to donate money to American institutions, and the possibility of such gifts to this Bureau must be considered.

The commercial interests of the United States which pertain to the Philippine Islands can best be advanced by an adequate and thorough knowledge of the Archipelago, and not an inconsiderable portion of the information which is necessary must consist in the results of the study of the raw products. While the laboratories have endeavored to give as

much time as possible to a consideration of these materials, nevertheless the work in the main has been discouraging because of the fact that adequate chemical investigation necessitates an ample supply of the raw products; yet, under present conditions, as the influx must to a large extent come from persons not connected with the Bureau and hence not particularly interested in its progress, it has been almost impossible to secure authentic specimens in sufficient quantity for the prosecution of the work. Investigations which have been begun must very frequently lie idle because of lack of material for study, and this condition can only be remedied by the possession of an adequate force of collectors in the field. It would seem as if American business men interested in the development of the Islands, either from a commercial or a philanthropic standpoint, would easily be made to realize the desirability of supplying the laboratories for three years to come with approximately \$10,000 a year. This would enable us to keep four well-equipped parties in the field at all times, and would bring into the Bureau the material it so badly needs. The results would more than repay the outlay.

Interest in tropical medicine has developed markedly of recent years, and it must be understood that not only has this branch of scientific work taught us to understand the Tropics to as great an extent as has any other field, but it has reacted beneficially upon medical knowledge in temperate climates, and much has been learned from the facts gained near the equator which has been of advantage in the practice of medicine at home. Our knowledge of bacteriology and of the cause and prevention of disease in general has been materially widened by a study of the infections peculiar to warm countries, so that, to cite the case of amebic dysentery, epidemics which have occurred in temperate climates have been recognized as such by the aid of facts discovered in the Tropics. For this reason, and because interest in the foundation of institutions for medical research has been increasing in the United States, it would not seem unlikely that some funds could be obtained for the study of tropical medicine, either as library donations or by supplying investigators with funds for the journey across the Pacific and for their maintenance while in Manila. It will be recalled that the Marine Biological Station at Naples is to a certain extent supported by subscriptions from various colleges and universities throughout the world, these institutions having the privilege of placing one or more students in the laboratory as a return for their outlay. The Bureau of Government Laboratories in Manila, with its present facilities, would be an institution to which universities could subscribe with as much justice and as great advantage as they now do to Naples. If a number would agree to give \$1,000 a year toward the maintenance of the laboratories, the latter in turn would unquestionably admit free of charge and would furnish all facilities to a certain number of advanced students from each institution which had

such a connection with the Bureau. The result of the research so accomplished could be given out in a series of monographs in which the universities giving the aid would receive due recognition, and the manuscript would also be available for publication in whatever journal the author saw fit to place it.

The past year has not brought any advancement in the proposal to establish a marine biological laboratory. Interest in this branch of science has grown rapidly in the United States, where the advantages of the study of marine fauna and flora have been thoroughly recognized. Possibly it would be feasible to obtain a sufficient gift of money to erect the buildings and establish the laboratory if the Government would agree to maintain the institution afterwards. The field laboratory could be placed in some favored situation on an island to the south of Manila where the investigators would be able to have access not only to deep water but also to the shoals and currents caused by numerous channels, such as can be found in the neighborhood of Busuanga. The establishment of a central laboratory at Manila, and, in connection with it, a public aquarium, the admission to which would to a certain extent defray expenses, would be advisable.

The botanical laboratory, touching, as it does, so closely upon the commercial interests of the Islands, is also a division of the work which might justly receive partial support from outside sources. The library has been founded by the Commission, but, because of the great variety of work which must find its literature at hand in the Islands, it could be expanded to double its present size without being open to the criticism of being extravagantly planned. The Government has done its share, as far as it is able to do so, and it is to be hoped that someone may be found sufficiently interested in the scientific development of the Far East to provide the institution with additional funds for the purpose of increasing the literature at hand and for the purchase of more expensive sets of periodicals.

It would seem advisable to give the Superintendent authority, when he visits the United States, to canvass the field and to discover what donations, if any, can be secured. While such a course would involve travel and an outlay of time, its result, even though no actual donations were secured in the first year, would in time unquestionably amply repay the expense.

During the past year the laboratory force has been increased through the efforts of the honorable the Secretary of the Interior, who, during his leave in the United States, visited the majority of the prominent educational institutions and secured laboratory workers of a very high type. By this means there were brought to the laboratory staff a pathologist, Dr. Herzog; a chemist and investigator, Dr. Clover; a botanist and plant physiologist, Dr. Copeland; two botanical collectors, Messrs.

Elmer and Whitford; a chemist, Mr. Richmond, and two research workers from Harvard University, Drs. Brinckerhoff and Tyzzer, who, through the activity of Dr. Councilman, were provided with funds to prosecute investigations on the subject of variola in the Philippine Islands. The thanks of the Bureau are extended to him for his earnest efforts in its behalf.

Another advantageous result obtained by this personal visit to the American institutions was found in the fact that the laboratories became known and the scope of their work understood, so that it is believed the great difficulty in securing men encountered in the past will not be met with in the future. However, it must be realized that the journey to the Philippines is a long one and that many persons who otherwise would gladly accept the opportunities offered, hesitate to do so because of the length of the journey and also because of the reputation which Manila has of being an expensive city in which to live.

The fear of scientific isolation should grow less and less as the knowledge of the character and the standing of the laboratory and of the facilities for work becomes more extended. The expense of living in the Islands should also diminish in the future, but nevertheless, as soon as it is possible, the salaries of scientific workers, if they are not merely graduate students but are men of advanced standing and experience, should be increased to a point commensurate with the training of the individual. To obtain a scientific training is expensive. It takes many years of hard study to enable a man to do more than simply follow out a few of the older prescribed methods. In the Philippine Islands a man who is not thoroughly capable of undertaking various lines of work and who is not also completely able to devote himself to his work is useless, because through lack of knowledge errors of the most fatal kind may be committed by him. The standard of excellence must be a high one, and, to maintain it, laboratory workers should be able to command higher salaries than do persons whose positions do not presuppose years of effort spent in acquiring their training. It is not as if candidates for positions were plentiful or as if we were able to command the best talent by attractions such as familiar surroundings or the traditions of institutions which have been founded for a long time. It is a new collection of laboratories with new surroundings and new conditions to face, and as such it must convince the world of its value before its vacant places will be sought after.

In the Philippine Islands there is preëminently a position for the higher type of educated American investigator, not only for the actual material results which he may obtain but also for the benefit which will accrue by his very presence in the community, and the value of his services should be recognized in a sufficiently substantial way to enable him to live properly as becomes his attainments.

OFFICE OF THE SUPERINTENDENT.

As was the case during the first two years of organization, by far the greater part of the time of the Superintendent in the year past has been taken by attention to details of administration. The rapidly increasing volume of the property of the Bureau, the addition of new lines of work, and the responsibility and care caused by the fact that this Bureau for a time had charge of the importation of Government animals rendered it impossible for the Superintendent to devote much time to actual scientific problems. Relief will be experienced in the near future owing to the fact that the Commission has given to the Bureau an accountable property clerk, thus relieving the Superintendent of the detail of property accountability, so that, after the confusion and care of moving are past, it is hoped that he will be able to devote a larger portion of his time to research. It is believed that it is the more expedient policy to give the Bureau adequate and competent clerical assistance than it is to take the Superintendent's time for many matters of detail which could well be managed by other persons. When his new private laboratory is completed and after he has canvassed the field in the United States the Superintendent hopes to secure a trained laboratory assistant to assist him in experimental work, so that a portion of each day may be given to new problems.

LIBRARY.

The growth of the library has been steady and satisfactory, although it has been found impossible up to the present time to secure a number of the more important complete sets of periodicals. Orders have been placed with European and American firms, and it is hoped that within the next two years the Bureau will be able to supply all of the essential literature. The work of receiving, classifying, filing, and indexing a rapidly growing library is very exacting, and the librarian, Miss Mary Polk, deserves great credit for the complete and accurate manner in which she has undertaken the organization of this division of the Bureau. Since the 1st of January authority has been given to transform, to a certain extent, the reference library into a loan collection, so that employees of other Bureaus may draw books on memorandum receipt and keep them for a certain number of days. While this privilege has not as yet been taken advantage of to the fullest extent, the use of the library is growing steadily, and in the new quarters it will probably find a more extended circulation than in the older and more inconvenient location.

The botanical works of the Bureaus of Forestry and Agriculture have been transferred to the Government Laboratories, and gradually the character of the library is being altered so that it may become the central depository of scientific books for the entire Government. This change naturally necessitates an increase in the duties of the librarian, and it

must be remembered that in the Philippine Islands, with its humid climate, the danger of deterioration in a library is much greater than it is at home; as a consequence constant vigilance must be exercised, and it is an absolute essential that a competent and active librarian be constantly in the service to take charge of the valuable collection. It is the belief of the Superintendent of Government Laboratories that the centralization of the library resources of the Government can be efficiently carried out by having one librarian in charge of all libraries for the purpose of receiving, registering, and cataloguing, and to have the divisions which necessarily must be deposited with the various Bureaus placed under the charge of assistants. This would avoid loss and deterioration of the books and would not add materially to the expense. As the smaller libraries grow it will become evident either that such a central system must be adopted or else a number of trained librarians engaged for other Bureaus of the Government.

In addition to her regular work the librarian has taken charge of the mailing list of the Bureau and has posted all of the bulletins which have been issued during the year, a work which in itself involves no little attention. Gifts have been received from a number of persons. The list will be found in the report of the librarian, and the thanks of the Bureau are extended for the courtesy.

SERUM LABORATORY.

From September 1, 1903, to July 1, 1904, the Serum Laboratory was under the able direction of Dr. James W. Jobling. Dr. Jobling resigned from the service for the purpose of having at least two years of study in America and abroad, and it is to be hoped that he will return to the Philippine Islands after this period is completed. His place was taken by Dr. Paul G. Woolley, formerly in the Biological Laboratory, who has been assistant director since February 1, 1904.

As heretofore, the preparation of antirinderpest serum and of vaccine virus has constituted the bulk of the work, yet other lines have also been undertaken. The proof brought by this laboratory that Texas fever in reality exists and probably has existed in the Islands for a number of years, so that all imported Chinese animals, including those from practically all Far Eastern ports, as well as cattle native to the Philippines, are practically immune to the disease, deserves especial attention. Therefore, animals arriving from nonimmune districts are sure to be attacked if they are not previously immunized, for a tick (*Boophilis australis*) capable of transferring Texas fever has been found in large numbers in the Philippines. The work of identifying this arachnida and of classifying it was done by Mr. Charles S. Banks, entomologist, now on leave in the United States, and a brochure on the subject was published in conjunction with the Texas fever bulletin of the Serum Laboratory.

The veterinary surgeons and inoculators of the Board of Health up to March 1, 1904, carried on provincial rinderpest inoculations under the guidance of the Director of the Serum Laboratory. After that date the veterinary corps was organized as a division of the Board of Health, and all of this work, as it should be, is now in charge of that Bureau, the laboratories only furnishing the serum for rinderpest inoculations. During the period of laboratory supervision the results of provincial work continued to be even more encouraging than heretofore. The details up to the time of transfer may be found in the report of the Director of the Serum Laboratory.

The other serums which have been issued at the laboratory or which are in the course of preparation are diphtheria, plague, and tetanus antitoxins.

The preparation of vaccine virus has been carried on without serious interruption, but experience has demonstrated that it is not wise to make this prophylactic during the hot season. Extra precautions were taken to cover the stable for calves with a shelter roof of nipa in order to keep it as cool as possible, but nevertheless a large percentage of the virus obtained during the months of April and May was of inferior quality. With the advent of cooler weather the difficulty has gradually disappeared. The new vaccine stables to be located at the main laboratory building will be of a permanent nature and will be constructed so as to give the best possible results.

The Director of the Serum Laboratory during the latter part of 1903 and the first months of 1904 practically had charge of the health of all carabaos imported from Shanghai. The appearance of surra among the herds after the disappearance of hemorrhagic septicemia and the fact that no adequate location was available in the neighborhood of Manila greatly increased the responsibility and anxiety of the undertaking. Under the circumstances the very best course possible was pursued, that of engaging a large pasture near Santa Mesa which acted as distributing point for the animals, but, owing to its proximity to Manila, surra finally attacked the animals even in this locality. Because of the knowledge that this fatal disease would probably sooner or later enter the herds at Santa Mesa, the Superintendent of Government Laboratories, even before the actual outbreak, visited several of the islands of the Archipelago by direction of the Civil Governor, in the hope of possibly discovering a suitable and isolated pasture ground to which imported animals could be sent. The Islands of Romblon, Sibuyan, Tablas, Masbate, Mindoro, and Burias were visited, and with the exception of the last named all localities presented serious objections to the herding of animals which, like the carabaos, need large quantities of water, because in most instances the streams which watered the pastures practically became dry during the season of no rain. Burias, however,

seemed to present an ideal condition, so that finally this island was decided upon, and after February 17, 1904, all animals imported from China were shipped to San Pascual, which was a former Spanish penal settlement on the Island of Burias. Starting from this point they were allowed to graze over the pasture land of the northern part of the island. This location made such a favorable impression that it was suggested as a permanent cattle station for experimental purposes when it is no longer needed for the use of the animals purchased for distribution.

Surra among carabaos does not seem to have the same invariably fatal results as it does with horses. Certainly a number of the animals, as will be seen from the report of the Director of the Serum Laboratory, have not died in the herd which became infected on the Island of Negros, but, on the contrary, at the present time the cattle are well and able to work.

The report of Dr. Paul G. Woolley covers the period from June 15 to August 30. As it deals with so short a period its recommendations need not be especially dwelt upon, but attention is called to the fact that in the Serum Laboratory as much as in any other the value of research work is apparent. The last word on the manufacture of serums and prophylactics has not by any means been rendered. Indeed, the science of serum therapy may be said to be in its infancy. In no other place can the Government derive more benefit from painstaking investigation than in this division of the Bureau of Government Laboratories. Some advance was made in the past year by securing the services of Dr. Ruediger as bacteriologist, but even under these improved circumstances so much of the time of the force is taken by the actual care of the animals and in making the serums for which at present there is a demand that but little of it can be given to improving the products or to the study of possible substitutes for the serums at present being prepared. The Bureau experienced much difficulty in engaging a man for the position of assistant director, and at the present time research has practically been abandoned; but, nevertheless, this vacancy has not been lost sight of, and it is hoped that it may be filled as soon as possible.

The Bureau has been fortunate in being able to obtain from its own force men capable of so successfully conducting the Serum Laboratory, and the work which they have done should be duly credited. In the future, however, it is certain that if we wish to maintain a high standard greater facilities for research work must be afforded the employees engaged in this division and the plane of salaries must be brought to a higher level.

But few improvements have been placed on the temporary grounds at San Lazaro during the year past, because it was known that in a short time that portion of the work which involved the use of the calves and horses would be transferred to the central laboratory grounds, leaving

only the rinderpest cattle at San Lazaro. The changes consisted chiefly in improvements on existing buildings. When the Serum Laboratory is installed in the new quarters it will be extremely advisable, when funds are available, to find land nearer the present laboratory building than is San Lazaro. The distance from Calle Herran to San Lazaro is nearly two miles, and consequently supervision of the work is handicapped very greatly. The Director of the Serum Laboratory and the Superintendent of Government Laboratories a year ago recommended a piece of city land in the barrio of Paco as the most available for the purpose of keeping the cattle. However, at the present time the cost of this transfer and the filling of the grounds would be too expensive to consider.

The difficulties formerly encountered in the keeping of small animals have been overcome, at least at present, and the laboratories now have available a good supply of guinea pigs, rabbits, white rats, and mice. If no epidemic disease is encountered it is hoped that we will no longer be compelled to purchase any of these necessary adjuncts to biological work in Japan. Nevertheless, it must always be remembered that in the Tropics, where such small animals are especially susceptible to outside influences, the occasion may come when the entire collection will be swept away by some epidemic disease.

BOTANICAL WORK.

During the past year efforts have been made to expand and improve the botanical work carried on by the Bureau for the various portions of the Civil Government in need of this class of assistance, and at the same time an endeavor has been made to increase the herbarium to the point at which it may be considered to be a thoroughly satisfactory working collection. To this end, through the assistance of the honorable the Secretary of the Interior, Drs. Copeland and Whitford and Mr. Elmer were engaged, the first as systematic botanist and the last two as collectors, and by reason of this addition to the force material has been coming in with great rapidity. However, it must be borne in mind that systematic botany and the building up of the herbarium are simply means to an end. A knowledge of the flora of the Islands is necessary before any great advances can be made in other branches of botany, and an herbarium is to be considered somewhat as bearing the same relationship to the botanist as a library does to other scientific workers, but the best results and those of the highest type can not be obtained except by extending into new fields. With this end in view it has been decided, as soon as facilities are available, to have Dr. Copeland take up the study of plant growth and physiology at the new forestry reserve at Lamao, where it is hoped a small laboratory can be erected for the purpose of carrying on his investigations. Dr. Whitford will also undertake some systematic study of forest flora in this district, and in that way an application of the knowledge gained by study of the herbarium will be made. This

will leave for actual systematic botany Mr. Merrill and Mr. Elmer, so that the growth of the herbarium in the next year will not be as rapid as it has been during the past.

Many duplicates have been sent to various institutions for distribution, and this policy will be continued, so that botanical workers will come into close relationship with other devotees of this science in foreign countries. It is very desirable that the identification of the specimens in the herbarium be carried on as rapidly and completely as possible. Much can be done here, but many portions of the work must necessarily be undertaken in localities where large permanent herbariums are accessible. For that reason it is suggested that at the close of this fiscal year Mr. Merrill be directed to proceed to those cities in Europe in which large herbariums are available. The time used in this way should occupy at least eight months in order to cover the ground of identifying and classifying such portion of the material upon which we have not been able thoroughly to decide.

As soon as funds are available it would be extremely desirable to obtain a good investigator who has specialized in plant pathology. The economic importance of plant diseases is not less than is that of planting and growing. Valuable crops which might be flourishing were it not for the ravages of disease might very well be saved by the intervention of the laboratories if they possessed a man thoroughly schooled in this branch of work. The Superintendent hopes that the botanical work may be expanded in the near future and that the plant physiologist and plant pathologist can be given positions where they can carry on their work with success. Private donations might be secured for the purpose of developing the botanical laboratory. All has been done that is possible with the means at hand, but the future must certainly show an advance as the past has shown a beginning.

The thanks of the Bureau are extended to the Bureau of Forestry for the many courtesies it has shown and for the great interest it has taken in this work. Its cordial coöperation in Lamo will certainly do much to advance interests of botany in the Islands. Further particulars in regard to botanical work will be found in the report of Mr. Elmer D. Merrill.

BIOLOGICAL LABORATORY.

During the past year the clinical work in the diagnosis of disease performed by the Biological Laboratory has quadrupled, and this increase is perhaps the most notable feature of the laboratory work. Research, of course, is carried on as much as possible, and its results are shown in the laboratory bulletins which have been published and made public by this means, but the record of clinical work appears only on the books of the institution. It will be seen that the public is increasing its demands on this laboratory and is reaching a better understanding of the necessity

of accurate diagnoses. As this recognition grows it is certain that the native population, which, up to a few years ago, has been practically ignorant of the modern methods, will become educated to their value, and in that way clinical diagnoses made by the laboratory will become as great a factor in prophylaxis as any other branch of sanitation. An average of 100 examinations a day is a large one, and it necessarily occupies a large proportion of the time of the force. Indeed, the danger with the present number of workers is that they may become discouraged in their outlook and stunted in their scientific development by too much routine, rather than that they will not have enough of this class of work to do. The major portion of the clinical work and examinations, as Table No. 1 will show, has been for gonococci for the Board of Health, and for surra, the latter determinations being necessitated by the fact that the Government has been importing large numbers of animals.

The Biological Laboratory was fortunate in securing the services of Dr. Maximilian Herzog as pathologist. Dr. Herzog entered the service in February, 1904, and since that time, in addition to a large amount of autopsy work, he has found opportunity to prepare two papers for publication and to have one nearly completed.

The effort of the laboratories to provide and care for a pathologic museum has been continued. Heretofore in the old quarters it has not been possible to separate and to properly classify the specimens which have been prepared, but now it is hoped that this important branch of the biological work will be placed in a good condition and will be subject to a steady growth. The collection will ultimately become too large for the present building, but it is hoped that by that time a permanent Philippine museum will be completed, in which all of the material not needed for immediate study can be placed and utilized by the general public.

The laboratory has especially, through the efficient work of Dr. Musgrave, continued the study of the appearance of amebæ in the Manila water supply as a branch of a general research which Dr. Musgrave and Mr. Clegg were carrying on, on the subject of amebic dysentery. Chemical analyses of the water have been regularly completed by the Chemical Laboratory and bacteria counts were made in the Biological Laboratory as early as the year 1902, but neither of these determinations would have shown the danger incident to the water supply had it not been for the work which demonstrated the possibility of diagnosing the presence of amebæ in drinking waters, and to which attention was called by Dr. Richard P. Strong, the Director of the Biological Laboratory, in his annual reports of 1902 and 1903. Chemically and bacteriologically the water of Manila has been very good during the past year, but for purposes of drinking it must be condemned unless previously boiled, because of the

continued presence of anebæ. It is hoped that collaboration with the office of the City Engineer will develop feasible methods of eliminating this source of danger from the new water supply which is soon to be installed, and to this end the laboratories will continue their investigations. So far the experimental filters constructed at the engineering shops have not been able to remove the organisms.

Although a large proportion of the work on the study of the diseases of cattle and the management during the first part of the year from a sanitary standpoint of the importation of these animals was under the direction of the Serum Laboratory, nevertheless the greater proportion of the diagnostic work was carried on by the Biological Laboratory, and on three occasions it has been necessary to send members of this force into the field for performing diagnostic work. For this purpose microscopes for travelers have been ordered and the laboratories are now in a position to thoroughly cover any outside field work which is necessary. A large proportion of these outside examinations have been for surra. The further particulars in connection with diagnostic work will be found in the report of the Director of the Biological Laboratory.

Researches of an especially noteworthy character have been carried on by Dr. Strong on a practicable cholera vaccine, by Dr. Herzog on bubonic plague and other subjects, by Dr. Wherry on the morphology of the cholera spirillum under varying conditions of environment, and a paper by Dr. Strong discussing some new phases of the theory of immunity is in preparation.

The entomological division of the Biological Laboratory has been increased by engaging Mr. Willie Schultze in addition to Mr. Charles S. Banks, after Mr. Webb, who was in the Islands for a short time as assistant entomologist, had left for America without having obtained any satisfactory results. The collection of insects has been materially increased during the past year and a representative portion of it sent to the Louisiana Purchase Exposition at St. Louis. The assistant entomologist, Mr. Schultze, has made several trips into the provinces for the purpose of studying insects which are attacking the cocoanut trees, and his results will be published in connection with laboratory bulletins discussing this important topic.

Work on the breeding and cultivation of butterflies and moths with a view to producing silk of a marketable quality has also been begun.

The work both of botany and entomology is being carried on in rooms which were originally intended for bacteriological investigations, these branches of science having been transferred to the laboratories after the original building plan was completed. Herbaria and exhibits of insects of necessity occupy a large amount of space and need permanent and dry quarters, which it is hoped will be supplied when the new wings are added to the present building. That portion of the addition which is designed to accommodate the Forestry Bureau has in its plan

a large space for an herbarium and for museum purposes. The collections of this Bureau are daily increasing in value, and it is hoped a permanent place will be found in the museum for such portions as are not in daily use.

During the past year it has been easier to supply the Biological Laboratory with experimental animals, owing to the fact that the Serum Laboratory has been able to place the stock in better quarters and to have some results with breeding. Animal houses of a sanitary pattern have been planned to be placed near the laboratory structure, and work upon them will be begun in a very short time. The intention is not to have these additional structures as breeding places, but to use them for experimental animals and for a certain number to be kept in stock at the laboratories for biological work, the greater portion being retained in the breeding houses at San Lazaro.

CHEMICAL LABORATORY.

As is the case with the Biological Laboratory, routine analytical work in the Chemical Laboratory has been largely increased during the past year, and the growing demands of the public make it more difficult for the workers to secure any unbroken time for research. Chemical investigation is of a peculiar nature in so far as it requires the arrangement of complex apparatus and appliances. Very frequently operations which have been begun must necessarily be pushed through to completion or otherwise the materials will spoil and the work must be commenced anew. This of course incurs a loss in time, apparatus, and chemicals, so that it is in the interests of economy to so arrange the force as to give some of its members opportunity to pursue investigations without interruption. The Chemical Laboratory has also been handicapped during the year by sickness among its members, which necessarily threw a large proportion of routine work upon those remaining.

The natural products of the Islands, as is well known, are in an undeveloped state, and only by thorough research can all the conditions of their occurrence and all of the facts as regards their value be determined. While it might not at once be apparent that the money spent in investigations is well invested, the returns in the course of time would amply justify any outlay, and the longer the delay which is experienced in beginning these investigations the later will be the time when the results may become available for the general public. In the new building apparatus such as stills, extractors, vacuum driers, etc., will be on hand, and therefore the appliances necessary for commercial chemical research will be available. However, unless a sufficient corps of men is provided fully to utilize these facilities, they will not meet the ends for which they are designed. It is probable that no great loss has been experienced in the past by the lack of an ample working force, because of the inconvenient quarters formerly occupied by the chemical

laboratory and because of the fact that lack of field parties has not rendered it possible to systematically secure large amounts of material for investigation. However, in the future it must be borne in mind that either through private subscriptions or by Government aid a material increase in the chemical force must be made in order to secure the results looked for. A chemical investigation, if thoroughly carried out to secure reliable data and which finally will provide directions for new methods of manufacture or for new uses of old products, takes time; sometimes a year or more is consumed in obtaining results which are of value, because the worker at all stages needs to exercise ingenuity and skill in meeting new conditions—he is practically at all times an inventor. For the above reasons it is to be regretted that the financial condition of the Government is such that the force in the Chemical Laboratory has been curtailed by two individuals, and it is hoped that as soon as the resources will warrant these places will be refilled by men thoroughly trained and equipped.

As an example of the possible advantages of investigation may be cited the fact that a number of the cheaper gums and resins in these Islands on distillation apparently yield solvent oils similar to turpentine or to the higher boiling products of terpene distillation. These oils would be valuable for varnish manufacture, but at present it is almost impossible to learn the distribution of the trees and the amount which can be produced in the various provinces. An expenditure of time will also be necessary in determining the drying properties, ability of withstanding weather, etc., of these new products.

Work on the minerals of the Islands has been continued as rapidly as possible, but here again the results have been more or less fragmentary and have depended upon such material as may have been received by the Bureau. The coöperation of the Mining Bureau in this matter has been promised, and it is expected that in the future progress in a systematic way may be readily accomplished. The problem of the coal supply of the Islands is an extremely important one, and here again the field worker must combine with the chemist in the laboratory to produce the best results. The coal deposits should be systematically and thoroughly explored and in the end an official statement published which will give to the world data in such a form that investors may know exactly what to expect by a study of results obtained by modern analytical methods. While the older publications of the Spanish Government have been of value, the chemistry of coal has advanced so materially in recent years that much of the work needs to be done anew both by the Mining Bureau and the Government Laboratories. Some petroleum deposits have been discovered in the Islands, but as yet the data obtained have been scanty. Mr. F. A. Thanisch undertook a trip to Cebu with the purpose of investigating the conditions with reference to cement production. Owing to the difficult nature of the country and the bad roads he accomplished

but little in the direction indicated. He went to one of the petroleum wells, but found it in disuse. The samples of limestone and clay which he obtained are now being analyzed in the laboratory, and enough has been learned to render it probable that if a properly equipped field party could devote itself to the question of cement production for at least six months or a year, and if the laboratories could through its activities obtain complete analytical data, the founding of a new and important industry would be close at hand.

Cement is cited only as an example of what might be accomplished, and for this reason it is believed that the statement is justified that no better investment could be made than to procure for the laboratory a sufficient number of chemists to thoroughly carry on such exploratory work in the provinces as is not within the province of the Mining Bureau and to pursue investigations in Manila. Presumably the field parties of the Mining Bureau will, in the future, bring in a large number of specimens, and, as all accurate mineral analyses take time, it is probable that for this alone an increase in the working force is justified. Further details of the results of the mineral analysis can be seen from the report of Dr. A. M. Clover.

The investigation of cocoanut production with the especial view of determining the relationship between the environment, the nature of the trees, and the percentage of copra and oil produced, has been carried on as occasion warranted during the past year. In order to obtain more complete results, Mr. Herbert S. Walker was spared from the laboratory during a period of two and a half months and took up his quarters at the Government farm at San Ramon, where cocoanut trees are abundant. He transported with him drying ovens, balances, and such simpler chemical apparatus as could be used in the provinces, and at the farm he prepared quantitatively a large number of samples of copra from trees of his own selection, not only from selected nuts but also from large piles ready for copra production, so as to obtain a commercial average. The finished copra prepared by Mr. Walker was sent to the laboratory for oil determinations, and the complete results, utilizing both the San Ramon figures and those obtained in Manila, are now being compiled for the purpose of publishing a bulletin on the subject. About one hundred oil analyses still remain to be done before the work will be completed. It has been shown that the percentage of oil varies materially as between certain classes of trees, and that certain individuals throughout bear better nuts than others, but even the very best trees may show a considerable number of inferior fruits in which the weight of copra is much less than it should normally be. Mr. Walker has also studied the question as to how long a time nuts may be allowed to remain after picking before copra is manufactured from them without a loss in oil, and he has studied the age of the nut in its relation to oil production. Several other chapters on the cocoanut-oil investigation remain to be finished—

one in regard to the physiology of the tree and the relation of its growth to environment. This is a subject for the study of a plant physiologist, and as soon as opportunity offers Dr. Copeland will proceed to San Ramon to carry on investigations in this direction. Another interesting phase is the growth of the young cocoanut sprout and the relationship between the embryo and the nourishment present in the growing nut. These branches of the work will occupy some time and hence the other publication on the oil production will be prepared first.

During the year Mr. Bliss has made a large number of analyses of the water supply of Manila, and his figures, showing maxima and minima, are appended in Mr. Clover's report. This chemical investigation again has served to demonstrate the fact that at least to a large extent all chemical work on drinking waters is useless, because the danger to the public from such waters lies not so much in the chemical composition as in the presence of micro-organisms. Water which may be perfectly admissible from a chemical standpoint may, from a biologic one, be dangerous.

The routine work of analysis in the laboratory is given in the appended table. A large proportion of it has been performed by Mr. L. A. Salinger in a most efficient manner, and in the last few months Mr. George F. Richmond has been able to take the greater proportion of the samples submitted by the custom-house.

The laboratories have now been in operation very nearly three years, and although supplies have been renewed from time to time, an annual order for articles which have become useless or for items which are needed for efficient work, and which owing to their nature may have been omitted from the original orders, will be necessary. The last large order was authorized some eight months ago and another one is being prepared to submit to the Commission. It must be borne in mind that, although the laboratories are thoroughly equipped, with the increase in the staff of workers and with the development of the knowledge of conditions, some additional permanent apparatus will be needed, although the expenses in this direction will not compare with those of the original installation.

Dr. Gilbert N. Lewis, who has been appointed to take charge of the division of weights and measures, reached Manila on September 7, 1904, about two weeks before his laboratory rooms could be completed.

A short journey into the provinces will convince anyone that the confusion existing by the use of many different standards of measures and of weights is such that commercial transactions are rendered extremely complex and the chances for fraud multiplied. We have the metric system, and, superimposed upon it, since the arrival of the Americans, the English system of weights and measures. We also have measures of a somewhat indefinite character known as *manojos*, *gantas*, *cavanes*, *piculs*, etc., all of which theoretically have a metric equivalent but which practically vary from province to province. In the northern provinces

there are some peculiarly objectionable standards known as the "uyon" and "baar," which apparently have different metric equivalents in different regions, and none of which we have been able successfully to reduce to any standard.

In undertaking a review of the weights and measures of the Islands it will be absolutely essential, in the first place, to ascertain what measures are really in use, and to this end a considerable portion of the time of Dr. Lewis, during his first year in the Islands, must be taken in preliminary work on this subject both in Manila and in the provinces. When a thorough understanding of the conditions is reached, then it is hoped a law will be passed making the metric system the legal one in the Philippine Islands and giving the metric equivalent of all of the other popular standards. It does not seem reasonable or expedient at once to abolish the names for measures and weights which have been in use for so many years, but it will be feasible to prepare a legal equivalent for them in the metric system. One difficulty heretofore experienced has been in obtaining suitable blanks which can be standardized and issued to the various provinces, but it is believed that data are now at hand by which these necessary adjuncts can be purchased.

BUILDINGS AND GROUNDS.

Enough has already been said in the past reports in regard to the new building to render further remarks in this connection unnecessary; suffice it to say that from all present indications it will be perfectly satisfactory and of sufficient capacity to handle the work. While the floor space may seem large, it must be remembered that a room which will accommodate three or four clerks might be only sufficient for one scientific worker. Already it is obvious that all of the rooms will be occupied, but it is also true that each room will be able to take into it a larger number of workers than are at present available. Expansion will take place by putting more men into the individual rooms and not by utilizing space which at present is unoccupied.

The Serum Laboratory will have that portion of its work which relates to the preparation of vaccine virus and serums, the production of which depends upon horses, transferred to the new building, but there will still remain at San Lazaro the large herd of cattle for rinderpest inoculations. The amount of rinderpest serum which has been used during the past year has been so great that the latter herd has been increased to about one hundred and twenty animals. They can still be accommodated in the present buildings and in the grounds at San Lazaro, but their permanent retention in this location necessitates a great loss of time, because the distance to the San Lazaro Estate from the laboratories is over $2\frac{1}{2}$ miles. Another objection to these grounds is found in their limited area. For the best welfare of the serum herd the cattle should be allowed to graze, but the space at present available is too small for this

purpose. The Superintendent therefore reiterates his recommendation that as soon as possible some adequate space be found for these animals nearer the laboratory building, in Paco or Santa Ana. A number of repairs will be necessary at the present location, as the buildings are only of a temporary nature, being so built because of the supposition that all of this work would be transferred in the near future.

When the laboratory structure at Calle Herran is completed and the filling of the grounds is done provisions will need to be made for the care of the latter.

GENERAL REMARKS.

The steady growth of all the laboratories in the last two years has demonstrated that the plan originally adopted was the wise one, and that development in the future may be expected in the same degree as it has occurred in the past. In this connection the Superintendent of Government Laboratories wishes to again urge the necessity of adequate quarters for the employees of the Bureau. All of the men engaged in scientific work are college graduates; they have been accustomed to pleasant surroundings at home, and a discouraging feature of their arrival in the Philippines is the difficulty in securing even presentable rooms. In a country like this where hygienic surroundings are of the highest importance and where sickness causes such a large decrease in the normal efficiency of a working force, it is highly desirable that the members of a staff should be able to find suitable and healthful accommodations upon their arrival. Many of the laboratory workers at present live in small rooms and take their meals at various restaurants, where both the food and the drinking water are unreliable. Buildings in the form of bungalows, with suites of rooms able to accommodate a number of men would give the proper hygienic surroundings, and where enough are located in a group they will be able to manage their own table in such a way as to reduce the danger of infection to a minimum.

In the last annual report the Superintendent of Government Laboratories called attention to the advisability of modifying the original laws under which the Bureau was organized, and a draft of an act providing for this reorganization was submitted to the honorable the Secretary of the Interior. Perhaps it is as well that this draft was not acted upon for some time, because changes in the conditions and the addition of new branches of work would have rendered some modifications necessary, but nevertheless it is again urged that with the new building, the engineering force, and the increased necessity for general supervision of all laboratory work, the new law will be most advantageous in fostering the interests of the laboratories.

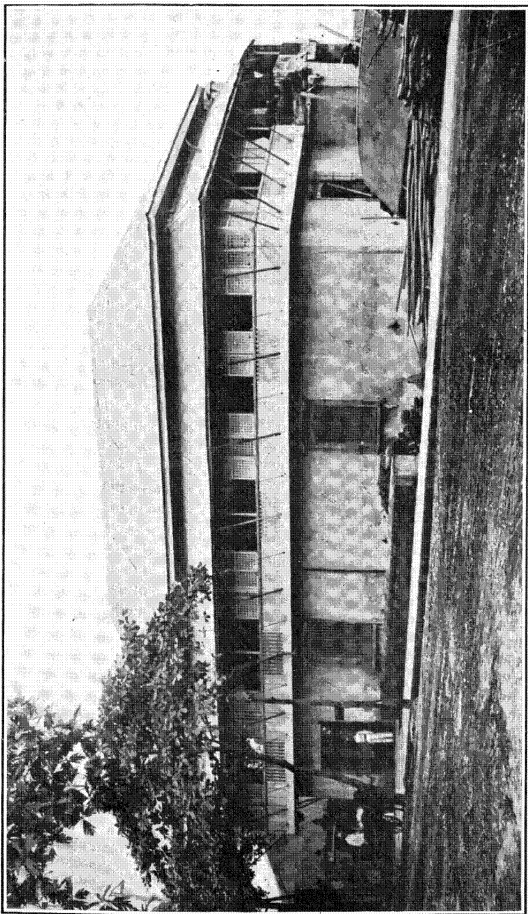
I am, very respectfully,

PAUL C. FREER,

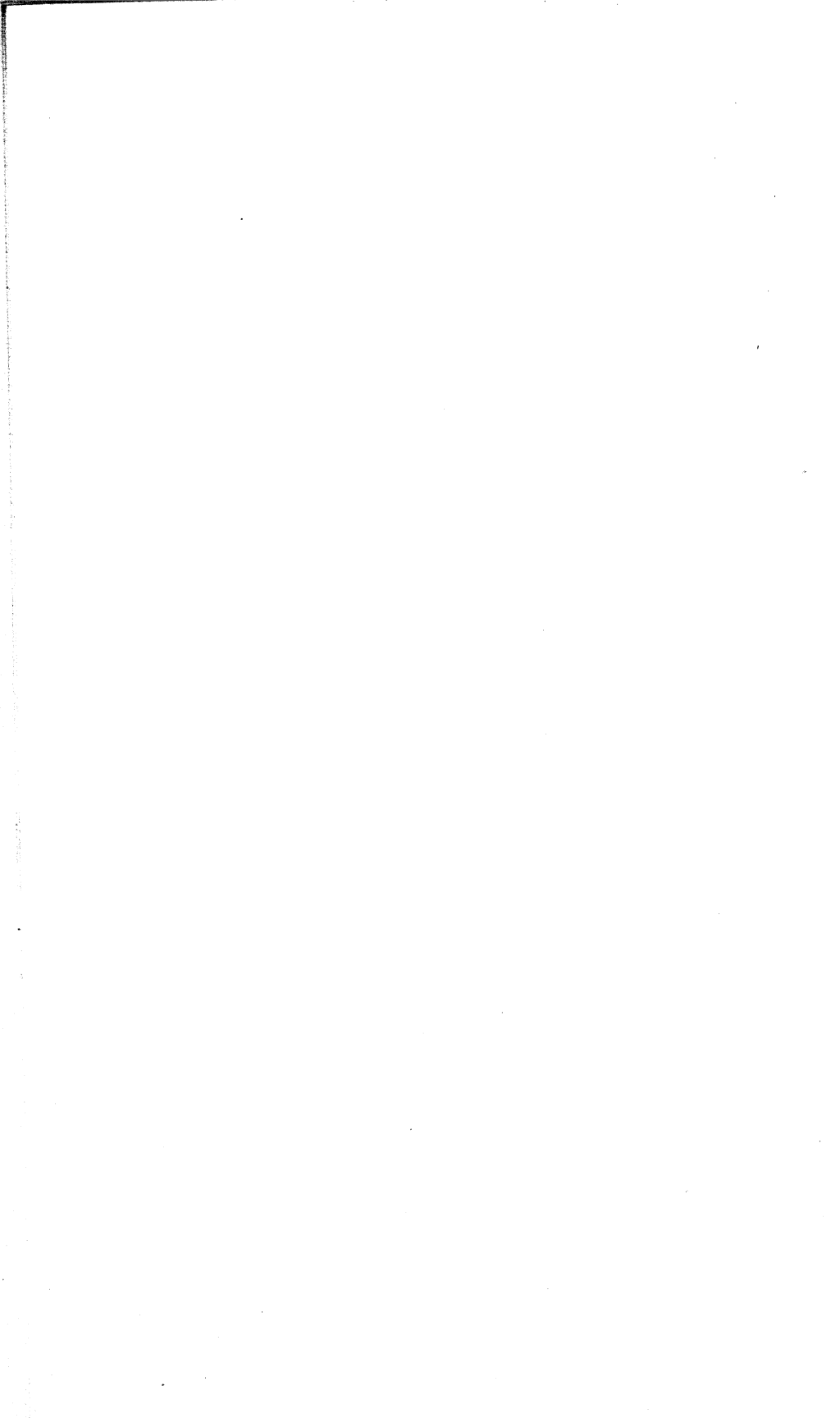
Superintendent Government Laboratories.

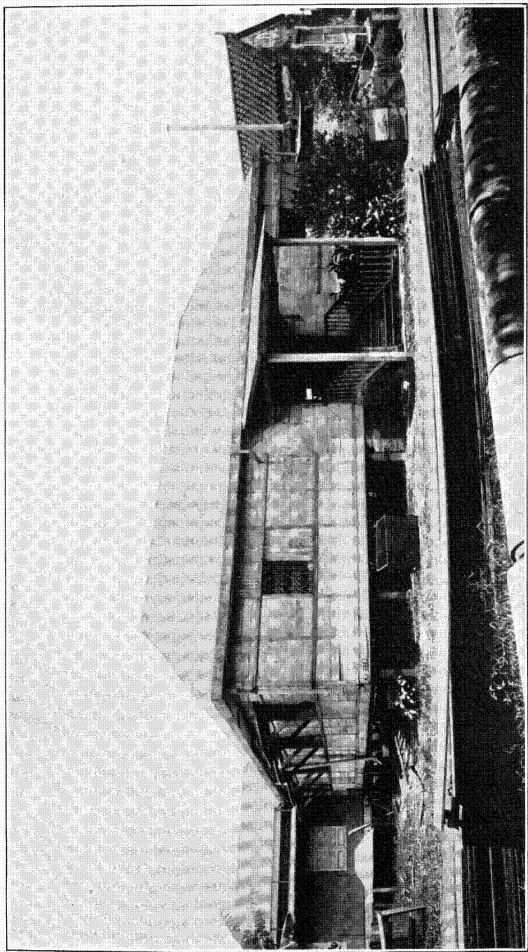
The SECRETARY OF THE INTERIOR,

Manila, P. I.

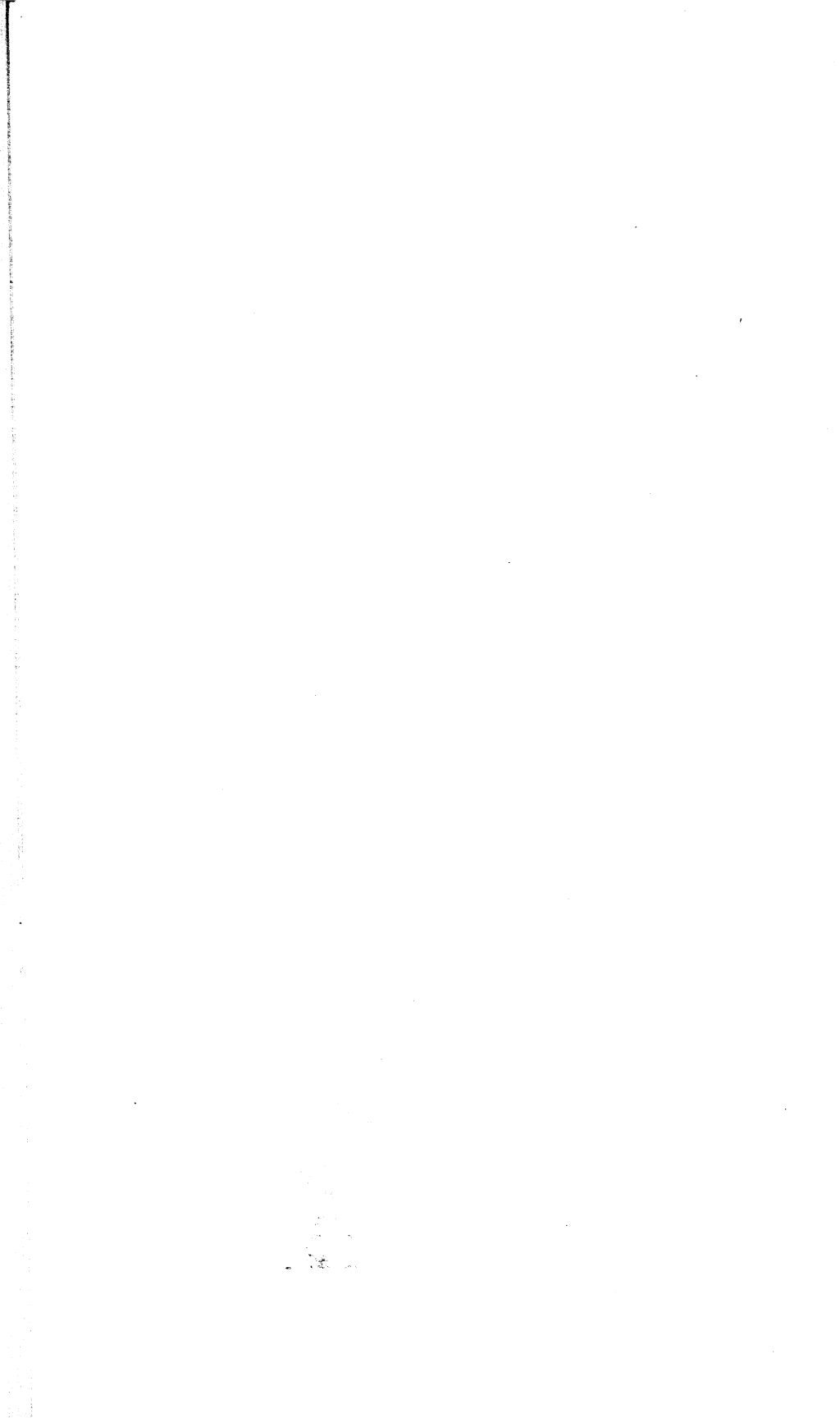


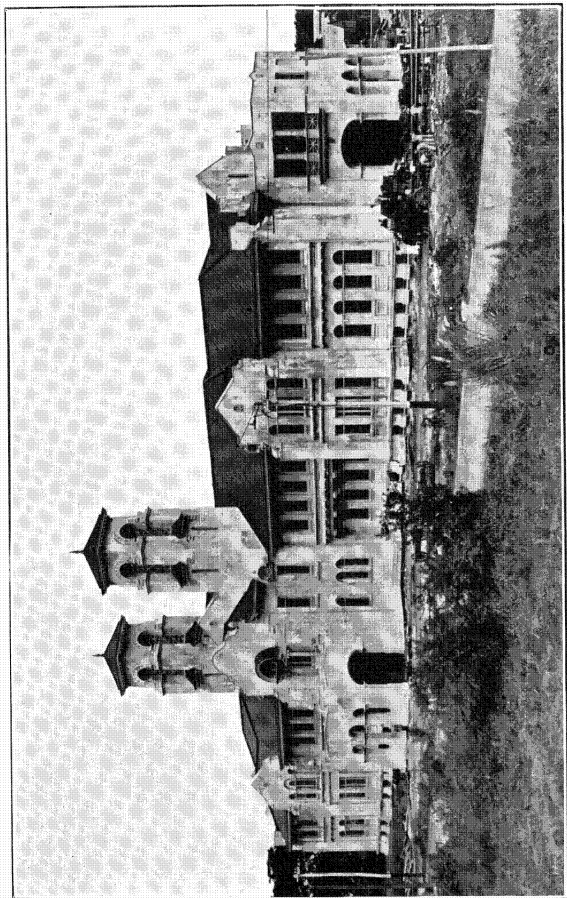
FORMER TEMPORARY BIOLOGICAL LABORATORY ON CALLE ALIX.



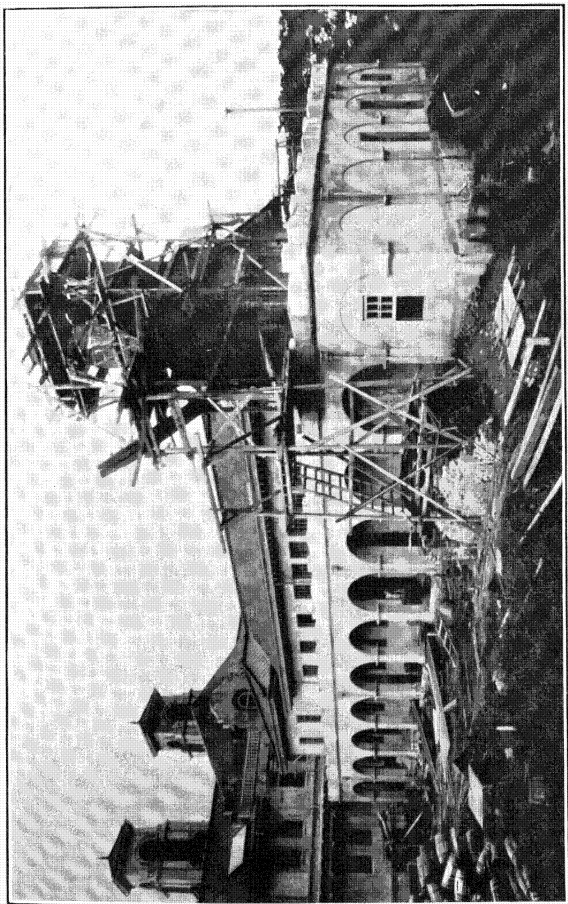


FORMER TEMPORARY CHEMICAL LABORATORY ON CALLE IRIS.

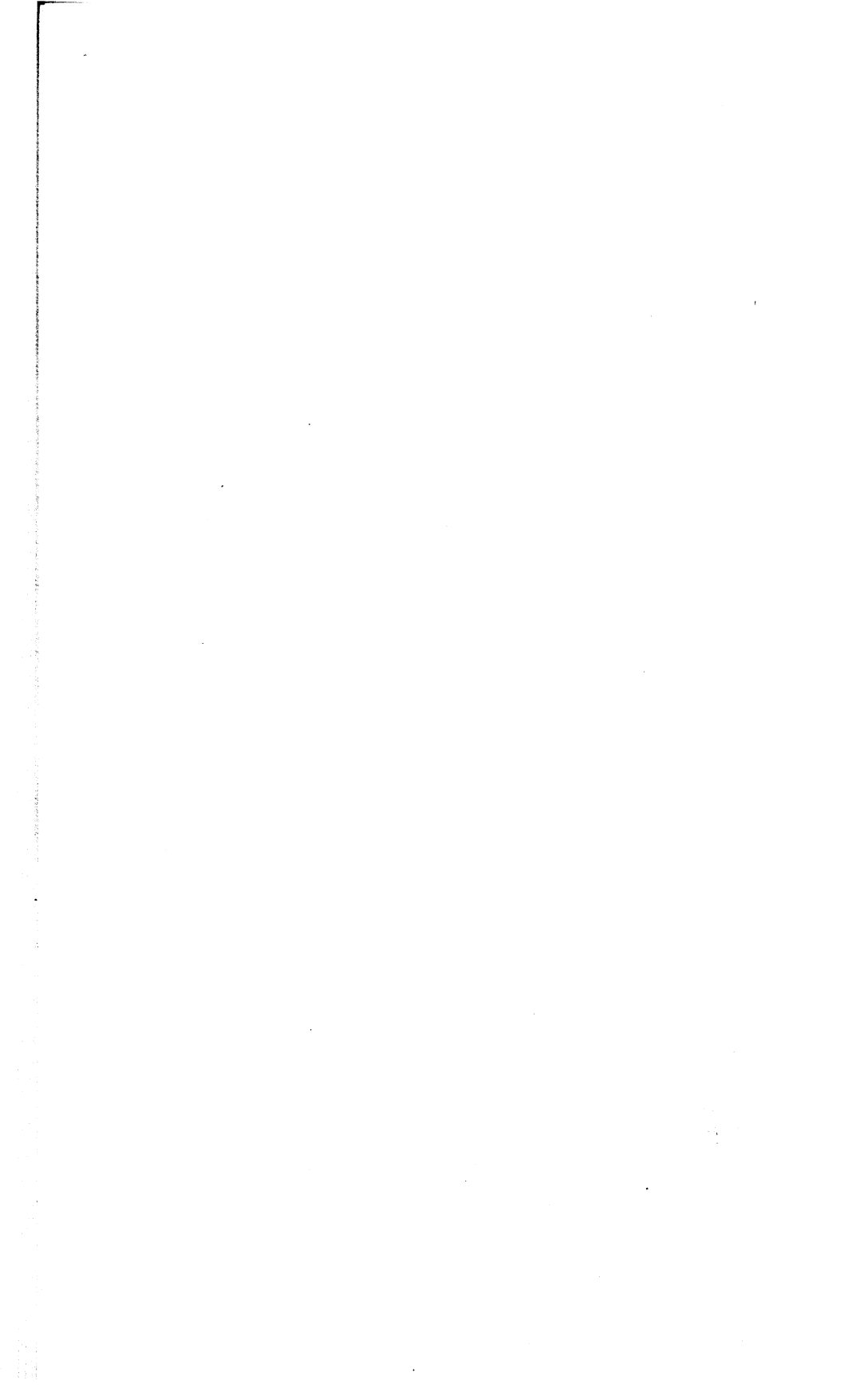


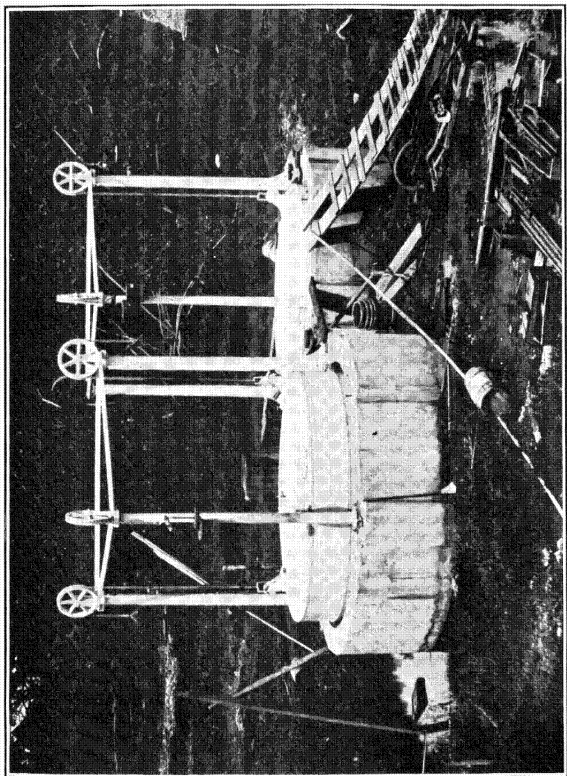


FRONT ELEVATION OF NEW LABORATORY BUILDING.

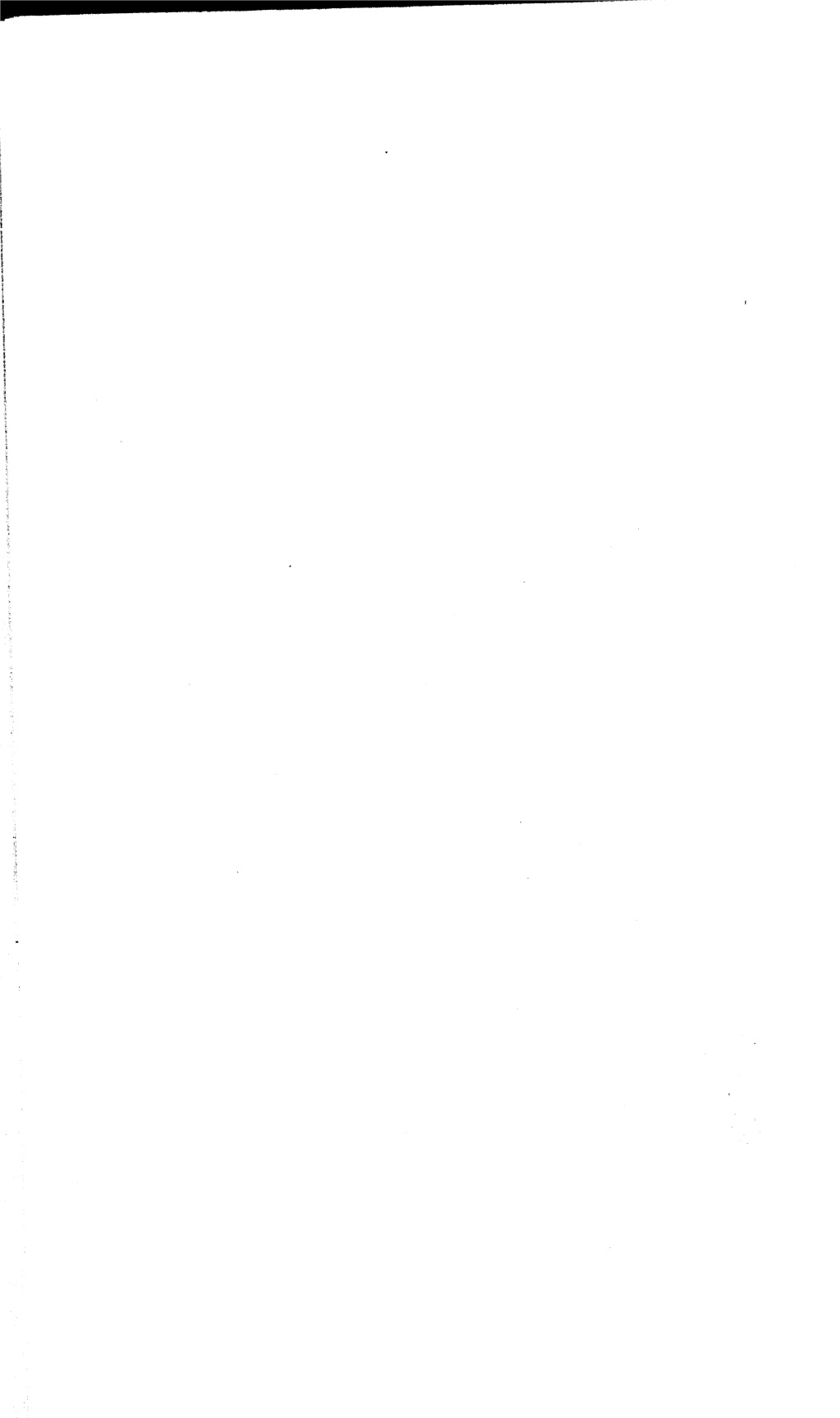


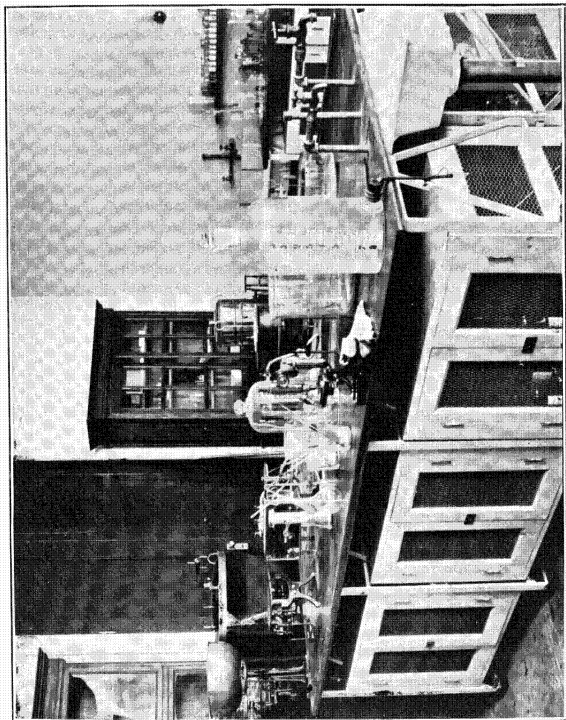
POWER HOUSE OF NEW LABORATORY BUILDING.



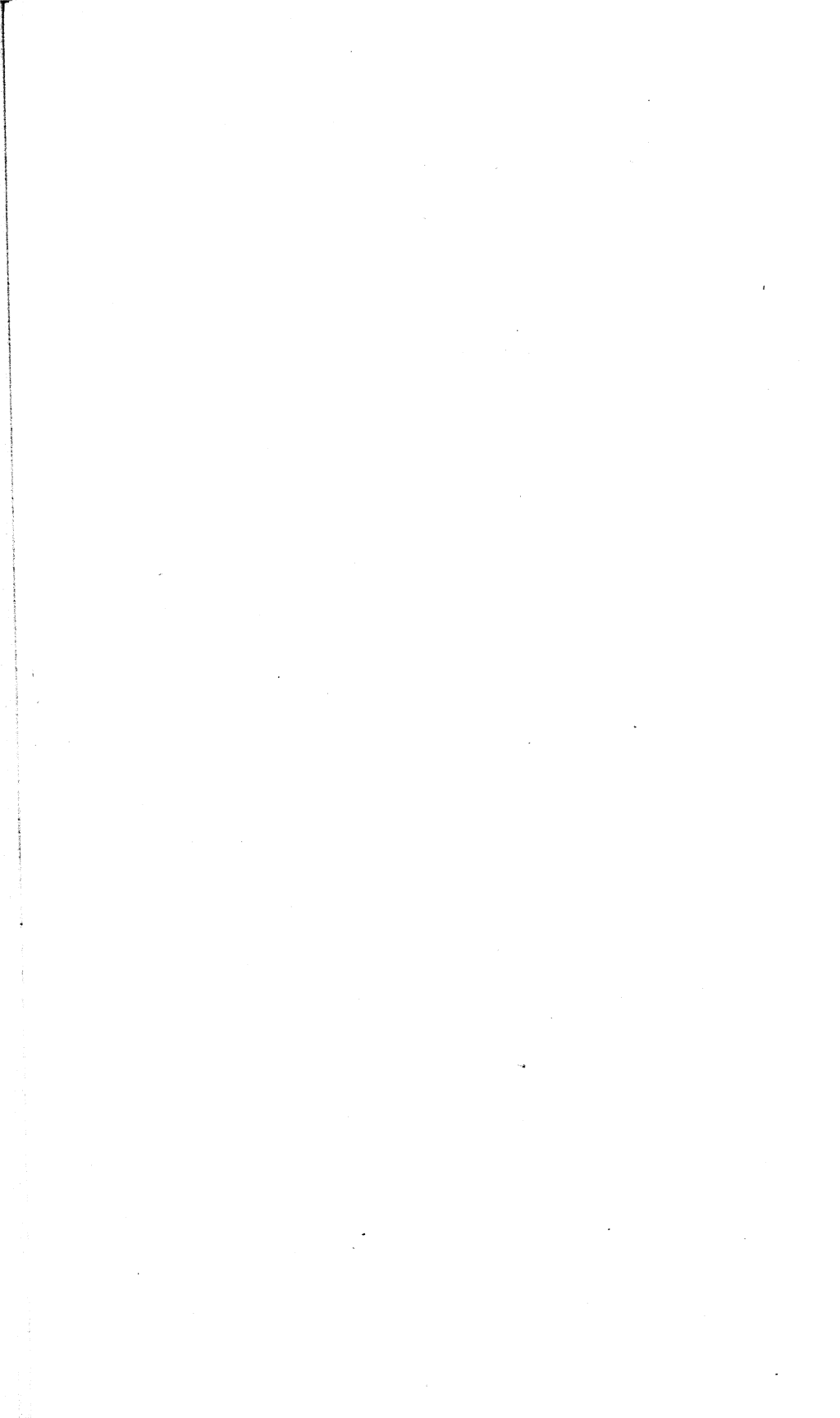


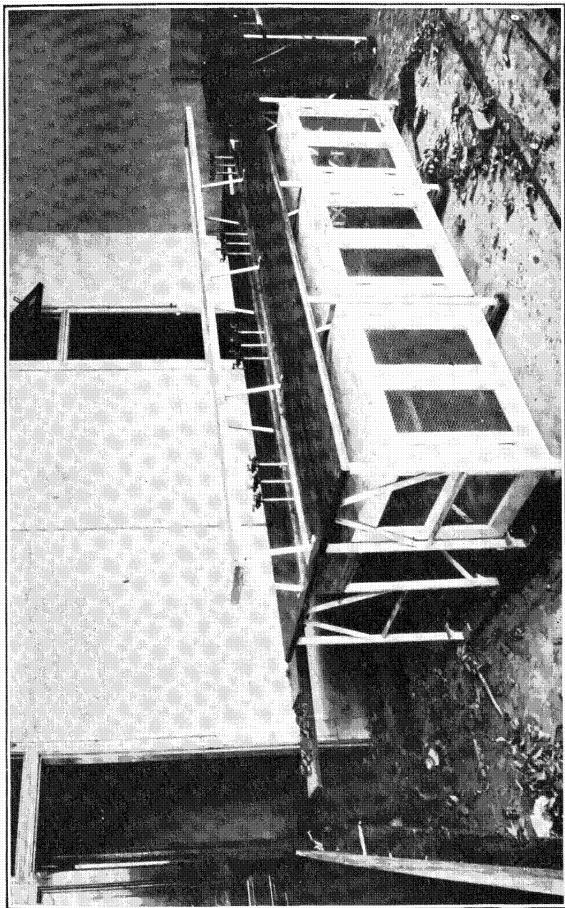
GAS TANKS OF NEW LABORATORY BUILDING.



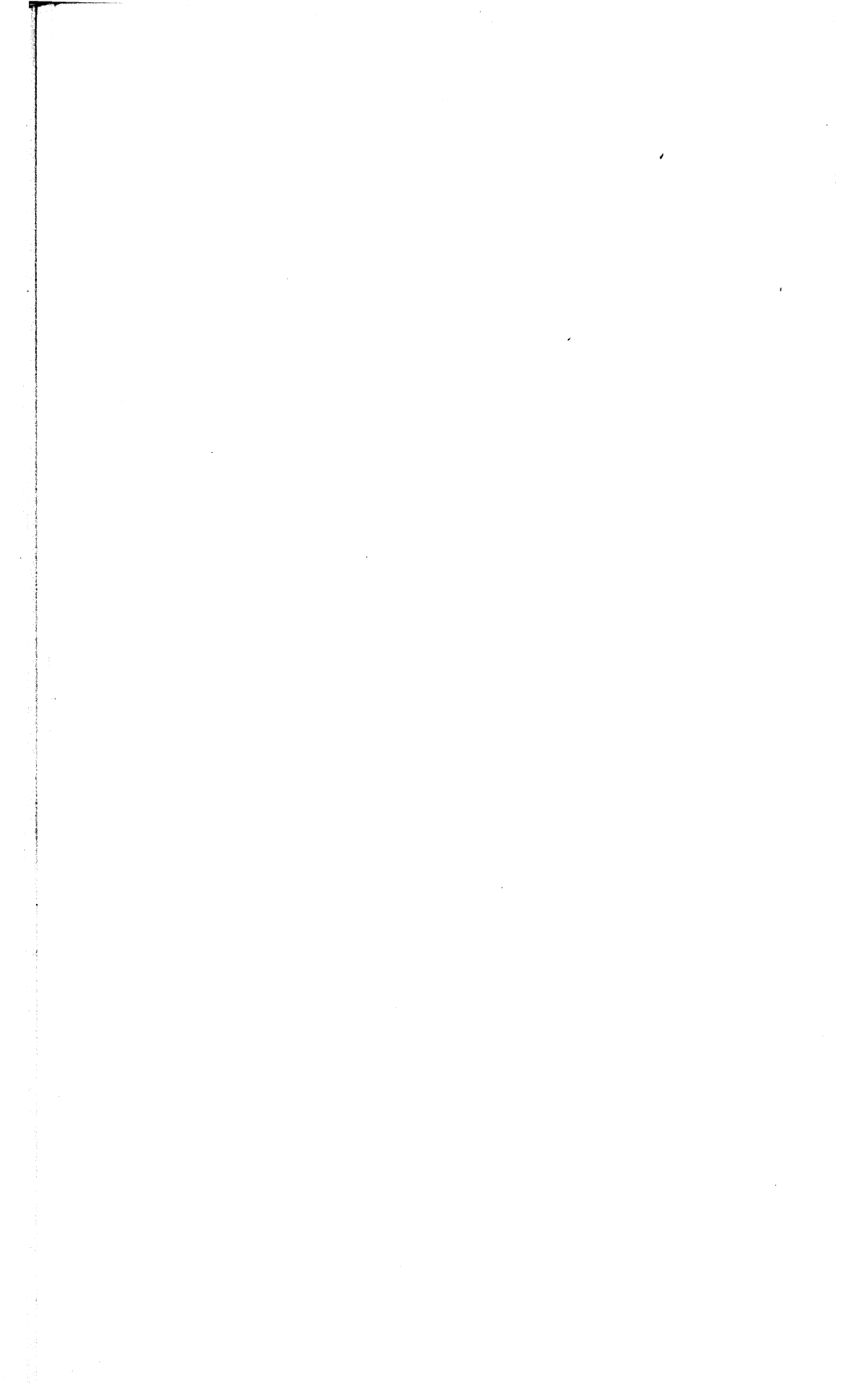


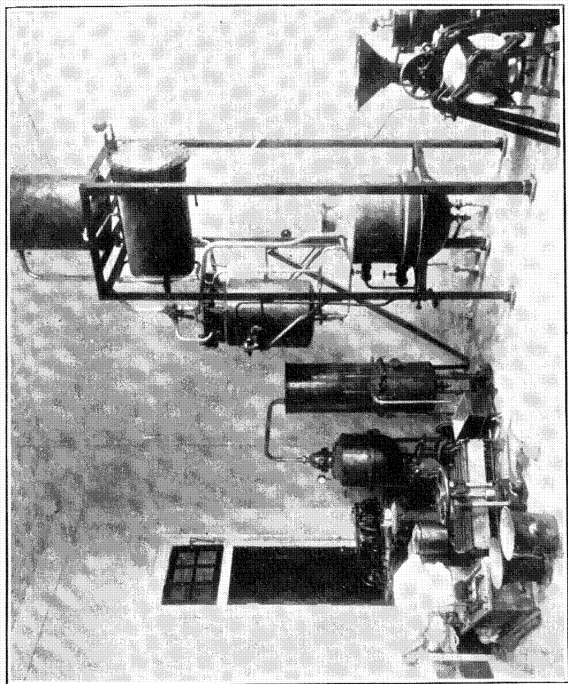
INTERIOR OF A WORKROOM IN THE BIOLOGICAL LABORATORY, NEW LABORATORY BUILDING.





INTERIOR OF A WORKROOM IN THE CHEMICAL LABORATORY, NEW LABORATORY BUILDING.





COMMERCIAL LABORATORY, NEW LABORATORY BUILDING, SHOWING STILL AND EXTRACTION APPARATUS

Animal No. 542.

Rinderpest

1904 at the Serum Laboratory, Manila, P. I.

Record of Variations of Temperature beginning

July 25

DATE OF BIRTH	DATE OF ARRIVAL	HEIGHT	WEIGHT	AGE	COLOR	SEX	NATIVITY	PRICE
1900	1900	5' 7"	150#	7	Black	F	Shanghai	4.15

Days of Isolation	$\Delta \log$	Days of Isolation	$\Delta \log$	Days of Isolation	$\Delta \log$	Days of Isolation	$\Delta \log$
1	0.00	11	0.00	21	0.00	31	0.00
2	0.00	12	0.00	22	0.00	32	0.00
3	0.00	13	0.00	23	0.00	33	0.00
4	0.00	14	0.00	24	0.00	34	0.00
5	0.00	15	0.00	25	0.00	35	0.00
6	0.00	16	0.00	26	0.00	36	0.00
7	0.00	17	0.00	27	0.00	37	0.00
8	0.00	18	0.00	28	0.00	38	0.00
9	0.00	19	0.00	29	0.00	39	0.00
10	0.00	20	0.00	30	0.00	40	0.00
11	0.00	21	0.00	31	0.00	41	0.00
12	0.00	22	0.00	32	0.00	42	0.00
13	0.00	23	0.00	33	0.00	43	0.00
14	0.00	24	0.00	34	0.00	44	0.00
15	0.00	25	0.00	35	0.00	45	0.00
16	0.00	26	0.00	36	0.00	46	0.00
17	0.00	27	0.00	37	0.00	47	0.00
18	0.00	28	0.00	38	0.00	48	0.00
19	0.00	29	0.00	39	0.00	49	0.00
20	0.00	30	0.00	40	0.00	50	0.00
21	0.00	31	0.00	41	0.00	51	0.00
22	0.00	32	0.00	42	0.00	52	0.00
23	0.00	33	0.00	43	0.00	53	0.00
24	0.00	34	0.00	44	0.00	54	0.00
25	0.00	35	0.00	45	0.00	55	0.00
26	0.00	36	0.00	46	0.00	56	0.00
27	0.00	37	0.00	47	0.00	57	0.00
28	0.00	38	0.00	48	0.00	58	0.00
29	0.00	39	0.00	49	0.00	59	0.00
30	0.00	40	0.00	50	0.00	60	0.00
31	0.00	41	0.00	51	0.00	61	0.00
32	0.00	42	0.00	52	0.00	62	0.00
33	0.00	43	0.00	53	0.00	63	0.00
34	0.00	44	0.00	54	0.00	64	0.00
35	0.00	45	0.00	55	0.00	65	0.00
36	0.00	46	0.00	56	0.00	66	0.00
37	0.00	47	0.00	57	0.00	67	0.00
38	0.00	48	0.00	58	0.00	68	0.00
39	0.00	49	0.00	59	0.00	69	0.00
40	0.00	50	0.00	60	0.00	70	0.00
41	0.00	51	0.00	61	0.00	71	0.00
42	0.00	52	0.00	62	0.00	72	0.00
43	0.00	53	0.00	63	0.00	73	0.00
44	0.00	54	0.00	64	0.00	74	0.00
45	0.00	55	0.00	65	0.00	75	0.00
46	0.00	56	0.00	66	0.00	76	0.00
47	0.00	57	0.00	67	0.00	77	0.00
48	0.00	58	0.00	68	0.00	78	0.00
49	0.00	59	0.00	69	0.00	79	0.00
50	0.00	60	0.00	70	0.00	80	0.00
51	0.00	61	0.00	71	0.00	81	0.00
52	0.00	62	0.00	72	0.00	82	0.00
53	0.00	63	0.00	73	0.00	83	0.00
54	0.00	64	0.00	74	0.00	84	0.00
55	0.00	65	0.00	75	0.00	85	0.00
56	0.00	66	0.00	76	0.00	86	0.00
57	0.00	67	0.00	77	0.00	87	0.00
58	0.00	68	0.00	78	0.00	88	

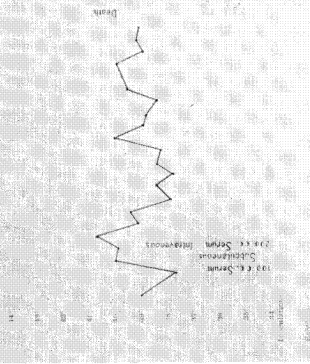


CHART 1.

Chart shows the primary attack of rinderpest controlled by use of antirinderpest serum, with the later rise of temperature followed by death. The autopsy showed the typical lesions of Texas fever and smears from the spleen showed the parasites. In this case the rinderpest was undoubtedly in the third or fourth day when the animal reached the laboratory.



BUREAU OF GOVERNMENT LABORATORIES.

Rinderpest

Animal No. 554

Record of Variations of Temperature beginning July 25, 1904, at the Serum Laboratory, Manila, P. I.

Kind of Animal	Height	Weight	Age	Sex	Locality	Color
Sheep	51"	550"	2 yrs	M	Shanghai	White
Day of Month	1	2	3	4	5	6
Time of Day	1	2	3	4	5	6

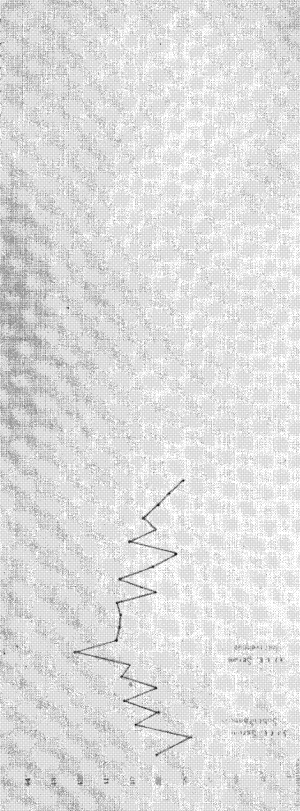


CHART II.

Chart shows record of an attack of rinderpest controlled by use of serum. When compared with a milder attack, and one not treated by the intravenous method, the difference in the curve will be marked, and especially the rapid fall of the temperature.

1995

Record of Variations of Temperature beginning

July 25

1904, at the Serum Laboratory, Manila P. I.

Steel
Column

WISCONSIN

10

constant

1-800-225-2866

740

COLOR

NATIVITY

FBI

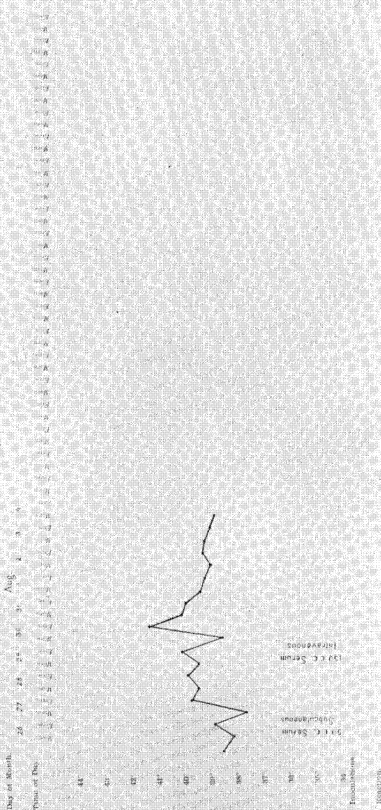


CHART III.

A comparison chart to show the same things indicated on Chart II.

BUREAU OF GOVERNMENT LABORATORIES.

Rinderpest
 Bureau No. 348
 1904 Out the Serum Laboratory, Manila, P. I.

Record of Variations of Temperature beginning July 25
 Rinderpest
 Weight 10 yrs
 Age 10 yrs
 Sex M
 Breed
 P. A. 348

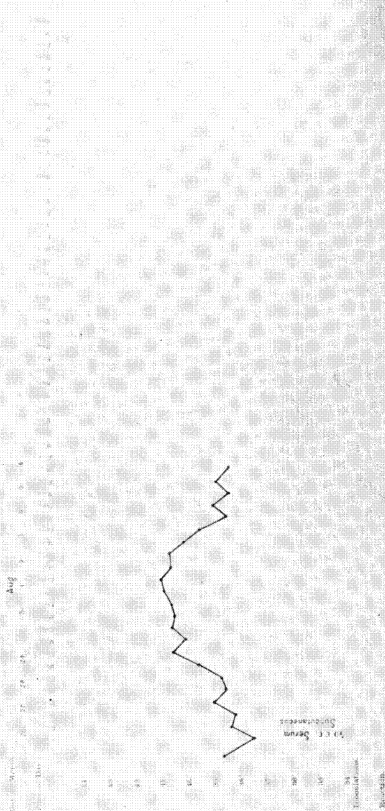


CHART IV.
 Chart shows the progress of an attack of rinderpest modified by the timely use of serum.



BUREAU OF GOVERNMENT LABORATORIES.

Animal No. 558

Rinderpest

1904 at the Serum Laboratory, Manila, P. I.

July 25

Record of Variations of Temperature beginning

KIND OF ANIMAL	HEIGHT	WEIGHT	AGE	COLOR	SEX	NATIVITY	PRICE
Cow	46"	500 lb	4 yrs	Red & White	F	Shanghai	U. P. A. 4.15

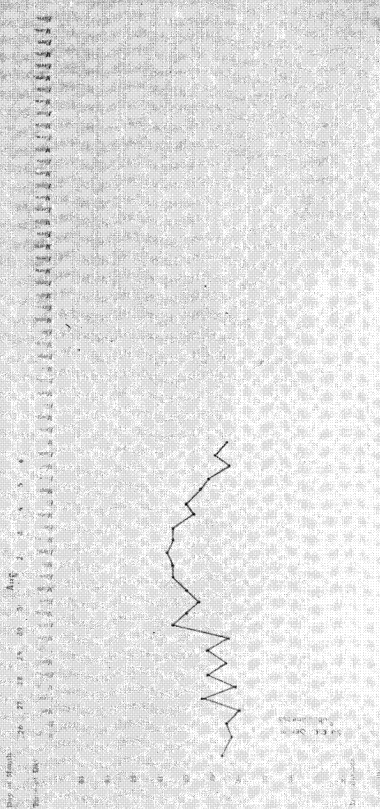
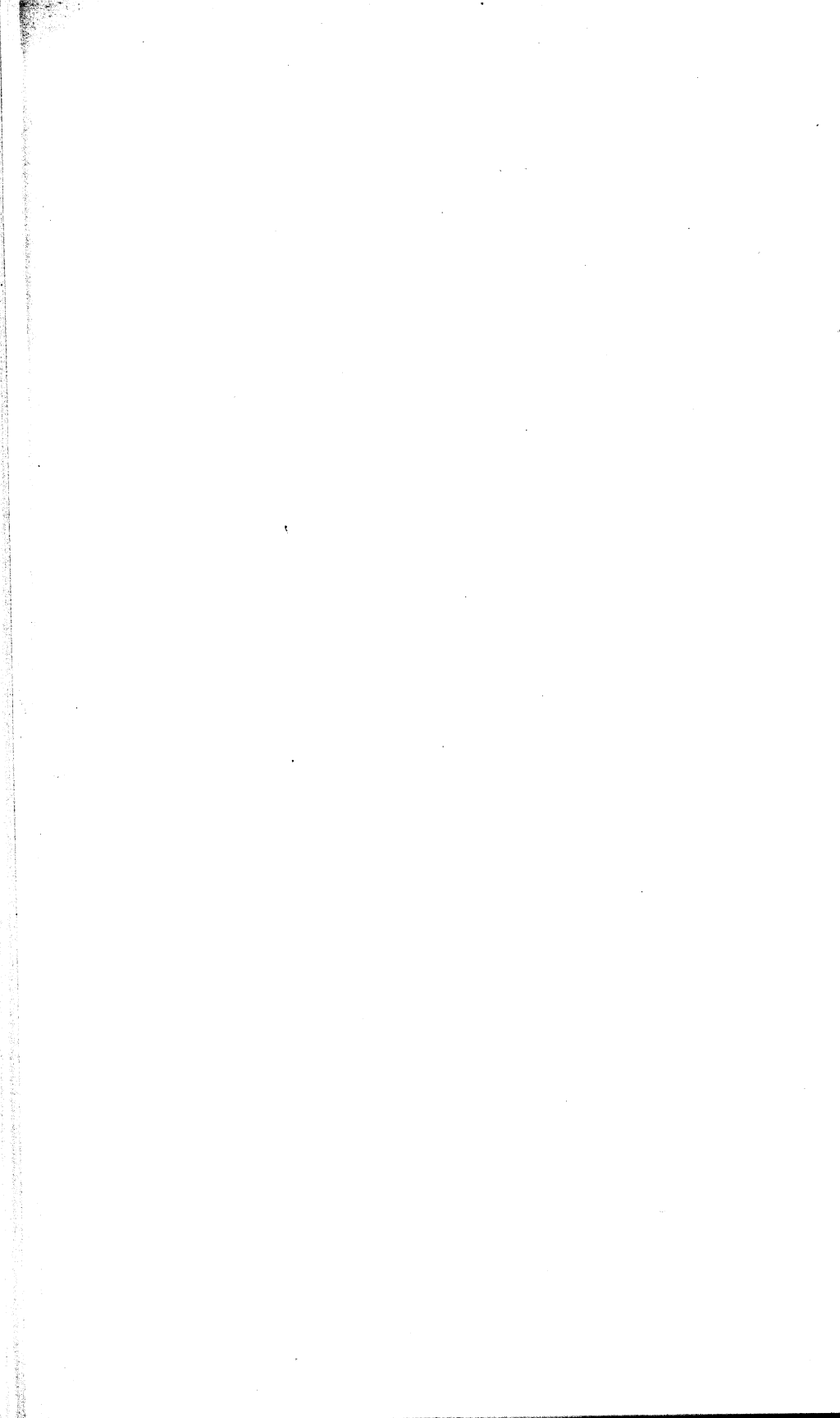
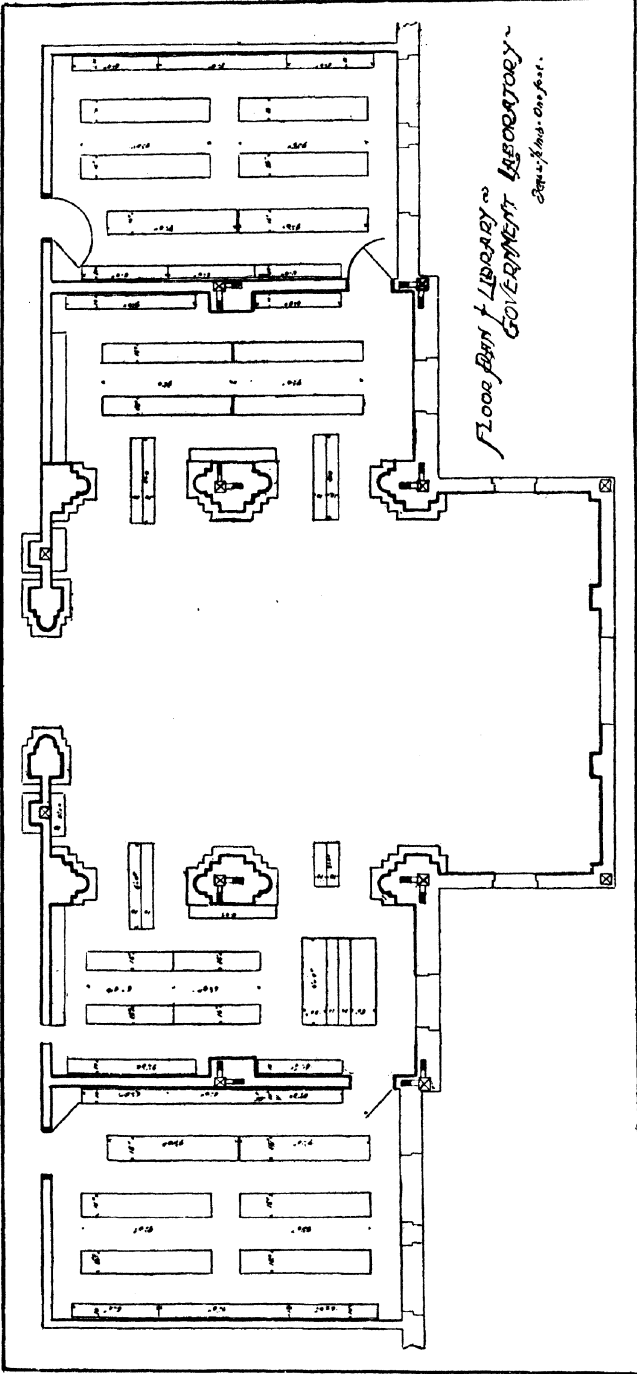


CHART V.
Chart to show the same things as Chart IV.





FLOOR PLAN OF LIBRARY ROOMS.

REPORT OF THE LIBRARIAN.

Following is the report of the librarian, Bureau of Government Laboratories, for the year ended August 31, 1904:

The library has steadily grown during the past year. Many books and sets of periodicals ordered during the preceding two years have been received and the number of current subscriptions greatly increased. Orders have been placed during the year for many valuable publications, a number of which have not as yet reached Manila, while many of them are already on the shelves. Recently delivery has been more prompt than in the past, but there still remain a large number of publications, including more than seventy sets of periodicals, ordered and not yet received. List (a) gives the subscriptions to current periodicals and (b) that of publications ordered but not as yet on hand.

The scope of subject-matter covered by the library has been greatly increased by transfers and by additions to the literature of new divisions. A large number of botanical works has been transferred from the Bureau of Agriculture and the Bureau of Forestry, and other botanical publications have been purchased. The library is indebted to Dr. David Prain, director of the Royal Botanic Garden, Calcutta, for a complete set of the valuable "Annals" of that institution. Many entomological titles have been added and many more ordered. The chemical and biological departments have been enriched by the addition of a number of valuable books and sets of periodicals. The list of publications on veterinary medicine has been greatly extended, as has also that of industrial chemistry, and these collections will be made more valuable when the present outstanding orders are filled. These divisions will also be greatly benefited when we receive complete sets of United States and foreign Government reports, of which we now have on hand approximately 2,500, catalogue by author and title and also by department publication number.

The library is now located in the new laboratory building on Calle Herran, where the rooms set aside for its use are admirably adapted for their purpose. It occupies a main reading room in which are placed current periodicals, reference books, and latest volumes received; four alcoves adjoining, three containing book stacks and one reserved for a workroom for the preparation for the shelves of incoming publications, and two side rooms, each 16 by 24 feet, containing stacks. The available shelf space in these rooms is approximately 4,500 feet. The stack rooms

are fitted up with adjustable metal stacks, are well lighted and ventilated, and provided wide aisles. The main reading room is furnished with a desk, card cabinets, reading tables and chairs, revolving bookcases, shelves for current periodicals, worktable, etc., made of native hard wood (*narra*). Provision is made for adequate artificial lighting and ventilation, so that one may read with comfort at any time during the day or in the evening. (See floor plan of library.)

The care of books is a vital question in library administration in Manila. In addition to deterioration from use, shelf wear, dust, etc., damage from insects and mold must be guarded against constantly. Books must be inspected daily and wiped off very frequently during the rainy season, on account of the mold, and constant vigilance must be exercised to protect against insects. We have found a varnish made from a formula [see Table (*c*)] prepared by two members of the laboratory staff to be very valuable in the care of books. This varnish dries very quickly, does not injure the books, and is a partial protection against the accumulation of mold. Cockroaches, which are great pests and are especially troublesome in eating covers of cloth-bound books, apparently do not attack them when they are treated with it, and, theoretically at least, it is a protection against all insects. Since we have used this preparation and kept the legs of the book cases in cans of petroleum, we have had no trouble with insects while books were on the shelves, but when left on laboratory desks it has not been uncommon to have them much damaged in a night. White ants (*anai*) have never attacked the library, although they have been present in both buildings previously occupied by it.

The rapidity with which the library has grown during the year, the great number of business details that could only be attended to by one constantly handling the books, the large amount of correspondence necessary in arranging for exchanges, securing missing numbers of periodicals and books already ordered, and the lack of assistance, have seriously retarded progress in classification and cataloguing. Accession books—one for current periodicals and one general accession book for all additions to the library—daily-receipts record, shelf list for all sets of periodicals on hand and for entomological publications, a business record of date ordered, requisition number, date received, date paid for, number of voucher on which payment is made, and price, for each title ordered or on hand, and an author-and-title index, constitute the records at present available for consultation. It is hoped that additional assistance will enable this work to progress more rapidly during the coming year. A copy of the general accession book is given below (*d*), in which appear titles of all works in the library August 31, 1904, arranged according to date of payment. A bulletin containing a systematic arrangement of titles will be issued from the laboratory in the near future.

All bulletins published by the Bureau of Government Laboratories are mailed from the library, which is also the depository for all publica-

tions available for distribution. The number of bulletins sent out from the library may be seen from the list below (e).

The library has received a number of valuable gifts during the year, while the exchange list is constantly growing. A list of donors and gifts is appended to this report (f).

(a) *List of current periodicals on file in library, Bureau of Government Laboratories.*

- | | |
|--|--|
| American Chemical Journal. | Biologisches Centralblatt. |
| American Journal of the Medical Sciences. | Boston Medical and Surgical Journal. |
| American Journal of Physiology. | Botanical Gazette. |
| American Journal of Science. | Botanische Jahrbücher. |
| American Medicine. | Botanische Zeitung, Part I and II. |
| American Veterinary Review. | Botanisches Centralblatt. |
| Anatomischer Anzeiger. | British Journal of Dental Science. |
| Anatomische Hefte. | British Medical Journal. |
| Annalen der Physik. | Bulletin de l'Académie de Médecine. |
| Annales de Chimie et de Physique. | Bulletin de l'Herbier Boissier. |
| Annales de l'Institut Pasteur. | Bulletin de l'Institut Pasteur. |
| Annales de la Société entomologique de Belgique. | Bulletin de la Société chimique de Paris. |
| Annales de la Société entomologique de France. | Bulletin de la Société entomologique de France. |
| Annales des sciences naturelles, Botanique. | Bulletin of the Johns Hopkins Hospital. |
| Annales du Jardin botanique de Buitenzorg. | Bulletin of the Torrey Botanical Club. |
| Annali d'Igiene sperimentale. | Bulletino delle scienze mediche. |
| Annals of Botany. | Canadian Entomologist. |
| Arbeiten aus dem kaiserlichen Gesundheitsamte. | Centralblatt für Agriculturchemie. |
| Archiv der Pharmacie. | Centralblatt für allgemeine Pathologie. |
| Archiv für Anatomie und Physiologie. | Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, First Part, Originale and Referate, and Second Part. |
| Archiv für Dermatologie und Syphilis. | Centralblatt für innere Medicin. |
| Archiv für experimentelle Pathologie und Pharmakologie. | Centralblatt für die medicinischen Wissenschaften. |
| Archiv für Hygiene. | Chemical News. |
| Archiv für klinische Chirurgie. | Chemisches Centralblatt. |
| Archiv für mikroskopische Anatomie und Entwicklungsgeschichte. | Chemische Industrie. |
| Archiv für Schiff- und Tropen-Hygiene. | Comptes rendus . . . de l'Académie des Sciences. |
| Archiv für Verdauungskrankheiten. | Comptes rendus . . . de la Société de Biologie. |
| Archiv für wissenschaftliche und praktische Tierheilkunde. | Correspondenz-Blatt für Zahnärzte. |
| Archives d'Anatomie microscopique. | Curtis' Botanical Magazine. |
| Archives de Biologie. | Dental Cosmos. |
| Archives générales de Médecine. | Dental Era. |
| Archives Italiennes de Biologie. | Dental Review. |
| Archives médicales de Toulouse. | Deutsche medicinische Wochenschrift. |
| Archives de Médecine expérimentale. | Deutsches Archiv für klinische Medizin. |
| Archives de Parasitologie. | Engineering and Mining Journal. |
| Archives des sciences biologiques (St. Petersburg.) | Entomological News. |
| Archivio per le scienze mediche. | Entomologische Zeitschrift. |
| Baumgarten's Jahresbericht. | Entomologisk Tidskrift. |
| Beiträge zur pathologischen Anatomie und zur allgemeinen Pathologie. | Entomologist. |
| Berichte der deutschen botanischen Gesellschaft. | Entomologist's Monthly Magazine. |
| Berichte der deutschen chemischen Gesellschaft. | Ergebnisse der allgemeinen Pathologie (Lubarsch-Ostertag). |
| Berliner klinische Wochenschrift. | Flora. |
| Berliner tierärztliche Wochenschrift. | Gazette des Hôpitaux. |
| Biographia Medica. | Gazette médicale de Paris. |
| Biochemisches Centralblatt. | Gazette . . . des sciences médicales de Bordeaux. |
| Biological Bulletin. | Gazzetta chimica Italiana. |
| | Gazzetta medica di Roma. |

(a) *List of current periodicals on file in library, etc.—Continued.*

- Genera Siphonagammarum.
 Giornale . . . veterinaria Italiana.
 Hooker's Icones Plantarum.
 Hoppe-Seyler's Zeitschrift für physiologische Chemie.
 Hygienische Rundschau.
 Index Kewensis.
 Index Medicus.
 India Rubber World.
 Indian Lancet.
 Indian Medical Gazette.
 International Clinics.
 International Dental Journal.
 Items of Interest.
 Jahrbuch der Chemie.
 Jahresbericht der Pharmacie.
 Jahresbericht über die Fortschritte der Agriculturchemie.
 Jahresbericht über die Fortschritte der Chemie.
 Jahresbericht über die Fortschritte der Physiologie.
 Jahresbericht über die Fortschritte in der Lehre von den Gärungsorganismen.
 Jahresbericht über die Fortschritte und Leistungen aus dem Gebiete der Hygiene.
 Jahresbericht über die Leistungen der chemischen Technologie.
 Jahresbericht über die Leistungen und Fortschritte in der gesamten Medicin.
 Johns Hopkins Hospital Reports.
 Johns Hopkins University Circulars.
 Journal de l'Anatomie et de la Physiologie.
 Journal d'Hygiene.
 Journal de Médecine de Paris.
 Journal de Médecine vétérinaire et de Zootechnie.
 Journal de Physiologie et de Pathologie générale.
 Journal für Chemie und Physik.
 Journal für praktische Chemie.
 Journal of the American Chemical Society.
 Journal of the American Medical Association.
 Journal of Applied Microscopy and Laboratory Methods.
 Journal of Botany, British and Foreign.
 Journal of the Chemical Society.
 Journal of Comparative Pathology and Therapeutics.
 Journal of Cutaneous Diseases including Syphilis.
 Journal of Experimental Medicine.
 Journal of Hygiene.
 Journal of Infectious Diseases.
 Journal of the Linnean Society, Botany.
 Journal of Medical Research.
 Journal of Pathology and Bacteriology.
 Journal of the Royal Microscopical Society.
 Journal of the Society of Chemical Industry.
 Journal of Tropical Medicine.
 Klinisches Jahrbuch.
 Lancet.
 Library Journal.
 Liebig's Annalen der Chemie.
 Medical Library and Historical Journal.
 Medical News.
 Medical Record.
 Medical Review.
 Medical Review of Reviews.
 Mittheilungen aus der medicinischen Facultät der kaiserlich-japanischen Universität zu Tokio.
 Monatshefte für Chemie.
 Monatsheft für praktische Dermatologie.
 Montreal Medical Journal.
 Münchener medicinische Wochenschrift.
 Nature.
 New York Medical Journal and Philadelphia Medical Journal.
 Northwest Medicine.
 Notizblatt des königl. botanischen Gartens und Museums zu Berlin.
 Oesterreiche Chemiker-Zeitung.
 Oesterreiche Monatschrift für Tierheilkunde.
 Pacific Dental Gazette.
 Pennsylvania Medical Journal.
 Pflanzenreich.
 Philosophical Transactions of the Royal Society of London.
 Photographic Times-Bulletin.
 Photographische Mittheilungen.
 Prager medicinische Wochenschrift.
 Presse médicale.
 Proceedings of the Royal Society.
 Progrès dentaire.
 Progrès médical.
 Progressive Medicine.
 Public Health Reports.
 Public Libraries.
 Quarterly Circular.
 Quarterly Journal of Microscopical Science.
 Recueil de médecine vétérinaire.
 Recueil des travaux chimiques des Pays-Bas et de la Belgique.
 Revue d'Entomologie.
 Revue de Médecine.
 Russkii Vrach.
 Sammlung chemischer und chemisch-technischer Vorträge.
 Schmidt's Jahrbücher.
 Science.
 Semaine médicale.
 Sperimentale.
 St. Louis and Canadian Photographer.
 St. Petersburger medicinische Wochenschrift.
 Stettiner entomologische Zeitung.
 Stomatologiai Közlöny.
 Therapeutic Gazette.
 Tierärztliche Zentralblatt.
 Transactions of the American Entomological Society.
 Transactions of the American Microscopical Society.
 Transactions of the Entomological Society of London.
 University of Pennsylvania Bulletins.
 Virchow's Archiv.
 Wiener entomologische Zeitung.

(a) *List of current periodicals on file in library, etc.—Continued.*

Wiener klinische Wochenschrift.
 Wiener medicinische Wochenschrift.
 Zeitschrift für analytische Chemie.
 Zeitschrift für angewandte Chemie.
 Zeitschrift für angewandte Mikroskopie.
 Zeitschrift für anorganische Chemie.
 Zeitschrift für Biologie.
 Zeitschrift für Hygiene und Infektionskrankheiten.
 Zeitschrift für Instrumentenkunde.
 Zeitschrift für klinische Medicin.
 Zeitschrift für öffentliche Chemie.

Zeitschrift für Pflanzenkrankheiten.
 Zeitschrift für physikalische Chemie.
 Zeitschrift für Thiermedizin.
 Zeitschrift für Untersuchung der Nahrungs- und Genussmittel.
 Zeitschrift für Veterinärkunde.
 Zeitschrift für wissenschaftliche Mikroskopie und für mikroskopische Technik.
 Zeitschrift für wissenschaftliche Zoologie.
 Zentralblatt für Gynäkologie.
 Zoologischer Anzeiger.

(b) *List of publications ordered but not as yet on hand.*

SETS OF PERIODICALS.

- Annales de Chimie et de Physique, to vol. 22, 7th series.
 Annales de la Société entomologique de Belgique, to 1903.
 Annales de la Société entomologique de France, to 1903.
 Annali d'Igiene sperimentale, to 1901.
 Arbeiten aus dem kaiserlichen Gesundheitsamte, to 1903.
 Arbeiten des botanischen Institut in Wurzburg, 1874-1888.
 Arbeiten des pharmakologischen Institut zu Dorpat, to 1902.
 Archiv der Pharmacie, to 1901.
 Archiv für Anatomie und Physiologie, 1825-1832.
 Archiv für Dermatologie und Syphilis, to 1904.
 Archiv für experimentelle Pathologie und Pharmakologie, to 1903.
 Archiv für Hygiene, to vol. 42.
 Archiv für klinische Chirurgie (Langenbeck's Archiv), vols. 1-71.
 Archiv für mikroskopische Anatomie und Entwicklungsgeschichte, vols. 1-57.
 Archiv für Verdauungskrankheiten, to 1903.
 Archives d'Anatomie microscopique, to 1903.
 Archivio per le scienze mediche, to 1901.
 Arkiv för Botanik, to 1904.
 Berichte aus dem physiologischen Laboratorium und Versuchungsanstalt der landwirthschaftlichen Institut zu Halle, to 1903.
 Berichte der deutschen botanischen Gesellschaft, to 1904.
 Berichte der schweizerischen botanischen Gesellschaft, 1891-1901.
 Berliner und deutsche entomologische Zeitschrift, 1857-1880.
 Berliner entomologische Zeitschrift, to 1905.
 Berliner tierärztliche Wochenschrift, 1893-1902.
 Botanisches Centralblatt, Beihefte, complete.
 Botanische Mittheilungen aus der Tropen, to 1901, all published.
 Bulletin de la Société entomologique de France, to 1903.
 Bulletin of the British Ornithologist's Club, 1895-1903.
 Centralblatt für Nahrungs- und Genussmittel, Chemie, complete.
 Centralblatt für Agriculturchemie, to 1903.
 Chemische Industrie, to 1901.
 Comptes rendus . . . Société de Biologie, to 1901.
 Deutsche medicinische Wochenschrift, to 1901.
 Historische Studien aus dem pharmakologischen Institut zu Dorpat, to 1903.
 Hooker's Journal of Botany and Kew Garden Miscellany, 1849-1857.
 Hygienische Rundschau, to 1903.
 Ibis, 1895-1903.
 India Rubber World, 1901-1902.
 Indian Medical Gazette, to 1903.
 Jahresbericht der Pharmacie, vols. 1-58.
 Jahresbericht über die Leistungen der chemischen Technologie, to 1903.
 Journal, allgemeines, der Chemie, 1798-1802 (Scherer).
 Journal de médecine vétérinaire, present series to 1903.
 Journal, neues, für Chemie, 1803-1806 (V. Gehlen).
 Journal, neues, für Chemie, Physik, und Mineralogie, 1807-1809.
 Journal of Applied Microscopy and Laboratory Methods, vols. 1-5.
 Journal of the Asiatic Society of Bengal, Natural History series, 1865-1903.
 Journal of Botany, British and Foreign, 1863-1903.
 Journal of Comparative Pathology and Therapeutics, vols. 1-15.
 Journal of Medical Research, vols. 1-5.
 Journal of Tropical Medicine, vols. 1-4.
 Just's Botanischer Jahresbericht, 1874-1903.
 London Journal of Botany, 1842-1848.
 Memoirs from the Biological Laboratory of the Johns Hopkins University, vols. 1-3.
 Mittheilungen aus dem medicinischen Facultät der kaiserlich-japanischen Universität zu Tokio, vols. 1-5.
 Münchener medicinische Wochenschrift, to 1901.

(b) *List of publications ordered but not as yet on hand*—Continued.

SETS OF PERIODICALS—continued.

Nature, to 1901.	Thompson-Yates Laboratory Reports and
Petites nouvelles entomologiques, 1869-1879.	Memoirs of the Liverpool School of Tropical Medicine, complete.
Philadelphia Medical Journal, vols. 1-8.	Transactions of the American Microscopical Society, 1903.
Prager medicinische Wochenschrift, to 1901.	Transactions of the Linnean Society, Second series, Botany, all published.
Quarterly Journal of Cryptogamic Botany, 1872-1894.	University of Pennsylvania Bulletins, to 1903.
Repertorium der analytischen Chemie, to 1887.	Wiener medicinische Wochenschrift, vols. 1-52.
Semaine médicale, to 1903.	Zeitschrift für angewandte Mikroskopie, to 1901.
Sitzungsberichte aus dem k. k. Akad. der Wissenschaften zu Wien, mathematisch-naturwiss. Klasse, to 1904.	Zeitschrift für Nahrungsmittel Untersuchung, Hygiene und Waarenkunde, to 1903.
St. Louis and Canadian Photographer, 1902.	Zeitschrift für öffentliche Chemie, to 1901.
Studies from the Department of Pathology of the College of Physicians and Surgeons, Columbia University, complete.	Zeitschrift für Pflanzenkrankheiten, to 1903.
	Zentralblatt für Gynäkologie, to 1903.

Publications ordered but not as yet on hand.....	76
Yearly subscriptions	20
Botanical publications	64
Entomological publications	74
Works on chemistry and allied sciences.....	23
Works on pathology, bacteriology, medicine, etc.....	18
Works on photography	2
Total	277

(c) *Formula for varnish.*

Shellac (pure white).....	grams.....	50
Resin	do.....	20
Bichloride of mercury.....	do.....	1
Alcohol.....	cubic centimeters....	1,000

Mix thoroughly, leave for twenty-four hours, then filter.

(d) *Copy of accession book and titles of all works on hand.*

	Volumes.
Abbott: Hygiene of Transmissible Diseases.....	1
Allen: Commercial Organic Analysis	6
Annales de l'Institut Pasteur, vols. 11-13.....	3
Barth: Cholera	1
Borden: Roentgen Rays	1
Borthen: Lepra des Auges.....	1
Copeman: Vaccination	1
Duhring: Cutaneous Medicine.....	2
Flügge: Grundriss der Hygiene.....	1
Frankland: Agricultural Chemical Analysis.....	1
Fresenius: Qualitative Chemical Analysis.....	1
Gill: Oil Analysis.....	1
Gould: Medical Dictionary.....	1
Griffin: Chemical Testing of Wines.....	1
Hoffmann and Power: Medicinal Chemicals.....	1
Journal of Experimental Medicine, vols. 1-4.....	4
Lepra Conferenz zu Berlin, 1-2, 3, 1-2.....	2
Muir and Ritchie: Bacteriology.....	1
Notter and Firth: Hygiene.....	1
Orth, J.: Special pathologische Anatomie, 1, 2, 2 Sup.....	3
Arbeiten a. d. kais. Gasundheitsamte, vol. 16.....	1
Rush: Medical Inquiries.....	1
Wernich-Springfeld: Sanitätsbericht	1

(d) Copy of accession book and titles of all works on hand—Continued.

	Volumes.
Scheube: Krankheiten der warmen Länder.....	1
Zeitschrift f. Hygiene, vols 32-35.....	4
Ziegler: Allgemeine Pathologie.....	1
Ziegler: General Pathology.....	1
Mez: Wasseranalyse	1
Moeller: Mikroskopie d. Nahrungs- u. Genussmittel.....	1
Rensen: Organic Chemistry.....	1
Roscoe and Schrelemmer: Chemistry.....	8
Smith: Electro-Chemical Analysis.....	1
Stillman: Engineering Chemistry.....	1
Thompson: Electricity and Magnetism.....	1
Velazquez: Spanish Dictionary	1
Wanklyn: Milk Analysis.....	1
Wanklyn: Water Analysis.....	1
Watts: Dictionary of Chemistry.....	4
Wiley: Agricultural Chemistry	3
Williams: Introduction to Chemical Science.....	1
Wood: Dispensatory	1
American Journal of the Medical Sciences, vols. 121-124.....	4
American Journal of Science, vols. 11-14.....	4
American Medicine, vols. 1-4	4
American Public Health Association Reports, vols. 26-27.....	2
Boston Medical and Surgical Journal, vols. 144-147.....	4
Cushny: Pharmacology and Therapeutics	1
Journal of the American Medical Association, vols 36-39.....	4
Journal of Medical Research, vols. 6-8.....	3
Journal of Pathology and Bacteriology, vols. 7-8.....	2
Long: Urine Analysis	1
Medical News, vols. 80-81.....	2
Medical Record, vols. 59-62	4
Medical Review of Reviews, vols. 7-8.....	2
New York Medical Journal, vols. 73-76.....	4
Pennsylvania Medical Journal, vols. 4-5.....	2
Philadelphia Medical Journal, vols. 9-10.....	2
Sternberg: Bacteriology	1
American Chemical Journal, vols. 1-24, Index.....	25
Boehm and Davidoff: Histology	1
Bulletin Johns Hopkins Hospital, 7 vols.....	7
Carpenter: The Microscope	1
DeLafield and Prudden: Pathological Anatomy and Histology.....	1
Ewing: Clinical Pathology of the Blood.....	1
Huber: Histology	1
Journal of Pathology and Bacteriology, vols. 1-6.....	6
Lee: Microtometist's Vade-mecum	1
Lunge: Sulphuric Acid and Alkali, vols 1-3.....	3
Mallory and Wright: Pathological Technique	1
Novy: Bacteriology	1
Osler: Practice of Medicine.....	1
Philips: Ore Deposits	1
Twentieth Century Practice of Medicine.....	20
Vaughan and Novy: Cellular Toxins	1
Whipple: Microscopy of Drinking Water.....	1
Malaria and Micro-organisms	1
Sternberg: Bacteriology	1
Tavera: Medicinal Plants of the Philippines.....	1
Allbutt: System of Medicine	8
American Chemical Journal, vols. 25-28.....	4
British Medical Journal, 88 vols.....	88
Bulletin Johns Hopkins Hospital, vols. 12-13.....	2
Chemical News, vols. 83-86.....	4
Halliburton: Chemical Physiology and Pathology	1
Hamilton: Pathology	1
Johns Hopkins Hospital Reports, vols. 1-10.....	10
Johns Hopkins University Circulars, vols. 20-21.....	2

(d) Copy of accession book and titles of all works on hand—Continued.

	Volumes.
Journal of the Chemical Society, vols. 1-88, Index, 1, 2, 3.....	91
Proc. Abstracts of Proc., and Cat. of Library, Chem. Soc.....	8
Journal of the Chemical Society, vols. 89-95.....	7
Journal of Experimental Medicine, vols 5-7.....	3
Journal of the Royal Microscopical Society, vols. 24-25.....	2
Journal of the Society of Chemical Industry, vols. 20-21.....	2
Lancet, 4 vols	4
Medical Review, 4 vols	4
Nature, vols. 63-66	4
Annales de Chimie et de Physique, vols. 22-27.....	6
Annales de l'Institut Pasteur, vols. 15-16.....	2
Annali d'Igiene Sperimentale, vols. 11-12.....	2
Archiv. der Pharmazie, vols 239-240.....	2
Archiv. f. Hygiene, vols. 40-45.....	6
Archiv f. mikroskopische Anatomie, vols. 58-60.....	3
Deutsches Archiv f. klinische Medizin, vols. 70-74.....	5
Virchow's Archiv, vols. 163-170.....	8
Archives de Parasitologie, vols. 4-5.....	2
Archives générales de Medicine, vols. 5-8.....	4
Archives d. Sciences biologiques (St. Petersburg), vols. 8-9.....	2
Archivio per le Scienze Mediche, vols. 25-26.....	2
Archives Italiennes de Biologie, vols. 35-38.....	4
Autenrieth: Auffindung der Gifte.....	1
Baumgarten's Jahresbericht, vols. 15-16.....	2
Beilstein: Organische Chemie, vols. 1-4, Sup. 1.....	5
Berichte der deutschen chemischen Gesellschaft, 6 vols.....	6
Berliner klinische Wochenschrift, vols. 38-39.....	2
Brauns: Chemische Mineralogie	1
Bulletin de la Société chimique de Paris, vols. 25-28.....	4
Centralblatt f. innere Medizin, vols. 22-23	2
Centralblatt f. Bacteriologie, 9 vols	9
Centralblatt f. die med. Wissenschaften, vols. 39-40.....	2
Chemische Industrie, vols. 24-25.....	2
Chemisches Central-Blatt, 4 vols.....	4
Classen: Mohr's Titrimethode	1
Classen: Analytische Chemie	1
Comptes rendus, Société de Biologie, vols. 53-54.....	2
Comptes rendus, Academie des Sciences, vols. 132-135.....	4
Dammer: Anorganische Chemie, 5 vols.....	5
Dragendorff: Ermittlung von Giften.....	1
Deutsche med. Wochenschrift, vols. 27-28.....	2
Gazette med. de Paris, vols. 72-73.....	2
Gazzetta Chimica Italiana	4
Giornale d. reale Societa veterinaria Italiana, vols. 50-51.....	2
Michaelis: Graham-Otto's Anorganische Chemie, 5 vols.....	5
Groth: Tabellarische Uebersicht der Mineralien.....	1
Guareschi: Alkaloide	1
Jahresbericht der Pharmacie, vols. 34-35.....	2
Journal d'Hygiene, vols. 26-27.....	2
Journal de Medicine de Paris, vols. 13-14.....	2
Journal de Physiologie et de Pathologie, vols. 3-4.....	2
Journal f. praktische Chemie, vols. 63-66.....	4
Landolt and Bornstein: Physikalisch-chemische Tabellen.....	1
Lassar-Cohn: Harnanalyse	1
Liebig's Annalen, vols. 317-325.....	9
Meyer and Jacobson: Organische Chemie	2
Menschutkin: Analytical Chemistry	1
Münchener med. Wochenschrift, 3 vols.....	3
Monatshefte f. Chemie, vols. 22-23.....	2
Stohmann and Kerl: Muspratt's Chemie, vols. 1-7.....	7
Photographische Mitteilungen, vols. 38-39.....	2
Kolbeck: Plattner's Probirkunst	1
Prager med. Wochenschrift, vols. 26-27.....	2
Presse médicale, 4 vols.....	4

(d) Copy of accession book and titles of all works on hand—Continued.

	Volumes.
Progrès médical, 4 vols.....	4
Geissler and Moeller: Real-encyclopedia d. ges. Pharmacie, vols. 1-10.....	10
Recueil des Travaux chimique, vols. 20-21.....	2
Richter: Lexikon der Kohlenstoff-verbindungen, 3 vols.....	3
Roth: Geologie, vols. 1-3.....	3
Sammlung chemischer Vorträge, vols. 1-7.....	7
Schmidt's Jahrbücher, vols. 269-276.....	8
Vratch, 2 vols.....	2
Russkii Vratch, 2 vols.....	2
Wiener klinische Wochenschrift, vols. 14-15.....	2
Zeitschrift f. analytische Chemie, vols. 40-41.....	2
Zeitschrift f. angewandte Chemie, vols. 14-15.....	2
Zeitschrift f. angewandte Mikroskopie, vols. 7-8.....	2
Zeitschrift f. anorganische Chemie, vols. 27-32.....	6
Zeitschrift f. Biologie, vols. 42-43.....	2
Zeitschrift f. Hygiene, etc., vols. 36-41.....	6
Zeitschrift f. klinische Medicin, vols. 43-47.....	5
Zeitschrift f. öffentliche Chemie, vols. 7-8.....	2
Zeitschrift f. physikalische Chemie, vols. 36-41.....	6
Zeitschrift f. physiologische Chemie, vols. 32-36.....	5
Zeitschrift f. Thiermedizin, vols. 5-6.....	2
Zeitschrift f. Untersuchung d. Nahrungs- u. Genussmittel, vols. 4-5.....	2
Zeitschrift f. wissenschaftliche Mikroskopie, vols. 17-18.....	2
Archives de Biologie, vols. 17-18.....	2
Bibliographia Medica, vol. 2.....	1
Ziegler's Beiträge, vols. 29-31.....	3
Buck: Reference Handbook of the Medical Sciences, vols. 1-4.....	4
American Journal of Physiology, vols. 6-8.....	3
British Medical Journal, vols. 89-92.....	4
Hamilton: Pathology, 2 vols.....	2
Johns Hopkins University Memoirs, vol. 4.....	1
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Zeitschrift für anorganische Chemie, vols. 34-38	5
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Zentralblatt für Gynäkologie, 1903	2
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Act of the Philippine Commission, English, vol. 13	1
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Annotated Acts of the Philippine Commission, English, vol. 2	1
Annotated Acts of the Philippine Commission, English, vol. 1	1
Agassiz: Nomenclator zoologicus, 1842-47	1
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Baillon: Adansonia, 1861-78	12
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(d) *Copy of accession book and titles of all works on hand—Continued.*

	Volumes.
Bergmann, Bruns, and Mikulicz: Handbuch der praktischen Chirurgie.....	4
Blume: Rumphia, 1835-1848	4
Candeze: Elatérides recueillis au Japon, 1872.....	1
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Drake del Castillo: Illustrationes Floræ Insularum maris Pacifici, 7 parts, 1886.....	7
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Forel: Indian Ants of the Calcutta Museum, 2 parts, 1885.....	2
Gaudichaud: Botanique du Voyage autour du Monde 1836-37 sur la Bonité.....	2
Green: Coccidæ of Ceylon, III.....	1
Hanshaw and Banks: Bibliography of the more important contributions to American economic Entomology, 7 parts	7
Holtermann: Mykologische Untersuchungen aus der Tropen.....	1
Hubner: Exotische Schmetterlinge, 7 parts	7
Jahrbuch des botanischen Gartens u. Museums zu Berlin.....	1
Junghuhn: Plantæ Junghuhnianæ, 1851-1855.....	1
Minerva	1
Miquel: Illustrationes de la Flore de l'Archipel Indien.....	1
Orth: Pathologische-anatomische Arbeiten, Festschrift	1
Pagenstecher: Die Lepidopterenfauna des Bismarcksarchipels.....	1
Presl: Epimella botanica, 1849	1
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Schimper: Pflanzengeographie auf physiologische Grundlage.....	1
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Total	11,306

(c) *Bulletins mailed from Bureau of Government Laboratories.*

Bulletin No.	Year.	Title and author.	Number.
1	1902	Biological Laboratory. Preliminary Report of the Appearance in the Philippine Islands of a Disease Clinically Resembling Glanders. By R. P. Strong, M. D. (Reprint, 1904)-----	1, 043
2	1902	Chemical Laboratory. The Preparation of Benzoyl-Acetyl Peroxide and its Use as an Intestinal Antiseptic in Cholera and Dysentery. Preliminary Notes. By Paul C. Freer, M. D., Ph. D. (Reprint, 1904)-----	1, 060
3	1903	Biological Laboratory. A Preliminary Report on Trypanosomiasis of Horses in the Philippine Islands. By W. E. Musgrave, M. D., Acting Director Biological Laboratory, and Norman E. Williamson, Assistant Bacteriologist, Bureau of Government Laboratories. (Out of print)-----	1, 000
3		Spanish edition-----	884
4	1903	Serum Laboratory. Preliminary Report on the Study of Rinderpest of Cattle and Carabaos in the Philippine Islands. By James W. Jobling, M. D., Director of the Serum Laboratory-----	1, 836
4		Spanish edition-----	2, 000
5	1903	Biological Laboratory. Trypanosoma and Trypanosomiasis, with Special Reference to Surra in the Philippine Islands. By W. E. Musgrave, M. D., Acting Director Biological Laboratory, and Moses T. Clegg, Assistant Bacteriologist, Biological Laboratory-----	1, 661
6	1903	I. New or Noteworthy Philippine Plants. II. The American Element in the Philippine Flora. By Elmer D. Merrill, Botanist. (Issued January 20, 1904)-----	1, 344
7	1903	Chemical Laboratory. The Gutta Percha and Rubber of the Philippine Islands. By Penoyer L. Sherman, jr., Ph. D., Chemist, Chemical Laboratory-----	951
8	1903	A Dictionary of the Plant Names of the Philippine Islands. By Elmer D. Merrill, Botanist-----	929
9	1903	Biological Laboratory. A Report on Hemorrhagic Septicemia in Animals in the Philippine Islands. By Paul G. Woolley, M. D., and James W. Jobling, M. D.-----	1, 343
10	1903	Biological Laboratory. Two Cases of a Peculiar Form of Hand Infection (Due to an Organism Resembling the Koch-Weeks Bacillus). By John R. McDill, M. D., and Wm. B. Wherry, M. D.-----	1, 000
11	1903	Biological Laboratory. Entomological Division, Bulletin No. 1: Preliminary Bulletin on Insects of the Cacao. (Prepared Especially for the Benefit of Farmers.) By Charles S. Banks, Entomologist, Bureau Government Laboratories-----	1, 000
12	1903	Biological Laboratory. Report on Some Pulmonary Lesions Produced by the Bacillus of Hemorrhagic Septicemia of Carabaos. By Paul G. Woolley, M. D.-----	925
13	1904	Biological Laboratory. A Fatal Infection by a Hitherto Undescribed Chromogenic Bacterium: Bacillus aureus foetidus. By Maximilian Herzog, M. D.-----	1, 186
14	1904	Serum Laboratory. Texas Fever in the Philippine Islands and the Far East. By James W. Jobling, M. D., and Paul G. Woolley, M. D., Biological Laboratory. Entomological Division, Bulletin No. 2. The Australian Tick (Boophilus Australis Fuller) in the Philippine Islands. By Charles S. Banks, Entomologist-----	1, 131
15	1904	Biological and Serum Laboratories. Report on Bacillus Violaceus Manilae: A Pathogenic Micro-Organism. By Paul G. Woolley-----	821
16	1904	Biological Laboratory. Protective Inoculation Against Asiatic Cholera: An Experimental Study. By Richard P. Strong, M. D. (In press. Edition of 1,500)-----	
17	1904	New or Noteworthy Philippine Plants. By Elmer D. Merrill, Botanist. (In press. Edition of 1,500)-----	
18	1904	Biological Laboratory. I. Amebas: Their Cultivation and Etiologic Significance. By W. E. Musgrave, M. D., and Moses T. Clegg. II. The Treatment of Intestinal Amebiasis (Amebic Dysentery) in the Tropics. By W. E. Musgrave, M. D. (In press. Edition of 2,000)-----	
19	1904	Biological Laboratory. Some Observations on the Biology of the Cholera Spirillum. By W. B. Wherry, M. D. (In press. Edition of 2,000)-----	

Total number bulletins printed and in press----- 33, 500

Total number bulletins distributed----- 20, 114

Available for distribution----- 13, 386

(f) *List of persons and institutions making donations to library of the Bureau of Government Laboratories, during the year ended August 31, 1904.*

Dr. David Prain, Director Royal Botanic Garden, Calcutta. (Annals of the Royal Botanic Garden, complete.)

Dr. William Trelease, Director Missouri Botanical Garden. (Reports of Missouri Botanical Garden, complete.)

- Dr. J. C. Willis, Director Royal Botanic Garden, Ceylon. (Bulletins.)
- Dr. M. Treub, Director 'sLands Plantentuin, Buitenzorg, Java. (Bulletins and reports.)
- Dr. H. N. Ridley, Director Royal Botanic Garden, Straits Settlements. (Bulletins and reports.)
- Director New York Botanical Gardens. (Bulletins.)
- Director Botanic Garden, New South Wales. (Report.)
- His British Majesty's consul-general for the Philippine Islands and the sanitary commissioner with the Government of India. (Report of the Indian Plague Commission, vols. 1-5, 1898-1899.)
- Prof. Dr. S. Kitasato, Director Institute of the Imperial Government of Japan. (Reports 1896-1903 and bulletins.)
- Dr. C. W. Daniels, Director Institute for Medical Research, Federated Malay States. (Bulletins.)
- Government, Cape of Good Hope. (Rinderpest bulletins and Agricultural Journal.)
- Egyptian Government. (Bulletins.)
- Hawaii, Board of Commissioner of Agriculture and Forestry. (Bulletins.)
- Jamaica, Department of Agriculture. (Bulletins.)
- Koloniaal Museum te Haarlem. (Bulletins.)
- Royal Asiatic Society, Straits Branch. (Journal.)
- Government Veterinary Surgeon, Singapore. (Report.)
- Academia Nacional de Medicina de Lima. (Bulletin.)
- Health Department of Government of Cuba. (Bulletins.)
- Surgeon-General's Library. (Transactions of the National Dental Association, 1860-1899; Transactions of the Southern Dental Association, 1897; Transactions of the American Dental Association, 1894.)
- Dr. Louis Ottogy. (Transactions of the Illinois State Dental Society, 1890-1900; Annual Report of the Illinois State Board of Dental Examiners, 1894; Constitution and By-Laws of the Chicago Dental Society.)
- Messrs. P. Blakiston's Son and Co. In response to request made by Dr. Louis Ottogy through the honorable the Secretary of the Interior, Manila, P. I., dental and medical books as follows: Bromell: Anatomy and Histology of the Mouth and Teeth; Gorgas: Dental Medicine; Gorgas: Harris' Principles and Practice of Dentistry; Tomes: Dental Anatomy; Warren: Dental Pathology and Medicine; Bartley: Medical Chemistry; Gould: Illustrated Dictionary of Medicine; Gould and Pyle: Cyclopedic of Medicine and Surgery; Kirkes: Handbook of Physiology; Morris: Human Anatomy; Montgomery: Text-Book of Gynecology; Stohr: Text-Book of Histology; Tyson: Practice of Medicine; Walsham: Surgery; Its Theory and Practice; Williams: Manual of Bacteriology.
- Publishers of the following dental journals sent in response to request made by Dr. Louis Ottogy through the honorable the Secretary of the Interior, Manila, P. I.: Quarterly Circular; British Journal of Dental Science; Correspondenz-Blatt für Zahnärzte; Dental Cosmos; Dental Era; International Dental Journal; Items of Interest; Dental Review; Pacific Dental Gazette; Le Progrès dentaire; Stomatologiai Közöny.
- Dr. Paul C. Freer, Superintendent of Government Laboratories, Manila. (Subscription to Science for 1904.)
- Dr. Louis Ottogy. (Outlines of Dental Pathology.)
- Drs. Freer and Novy. (On the Organic Peroxides. Reprinted from contributions to Medical Research, dedicated to Victor Clarence Vaughan by colleagues and former students of the Department of Medicine and Surgery of the University of Michigan, June, 1903.)
- Drs. Novy and McNeal. On the Cultivation of Trypanosoma Brucei. (Reprinted from the Journal of Infectious Diseases, vol. 1, No. 1, January 2, 1904, pp. 1-30.)
- Dr. Louis Ottogy. (Tropical Influence on the Diseases of the Oral and Dental Tissues. Reprinted from Dental Cosmos, December, 1903.)
- Dr. Edwin O. Jordan. (The Self-Purification of Streams; reprinted from Decennial Publications, University of Chicago, vol. 10. The Field of Municipal Hygiene; reprinted from Popular Science Monthly, June, 1903. The Connection between the Alkalinity of Certain Bacterial Filtrates and their Hemolytic Power; reprinted from the Journal of Medical Research, vol. 10, No. 1.)
- Dr. G. Bernard Smith. (Two Cases of Paratyphoid Infection—One Caused by an Aberrant Organism. Reprinted from the Journal of the American Medical Association, December 12, 1903.)
- Dr. C. Pulfrich. (A New Form of Refractometer. Reprinted from The Astrophysical Journal, vol. 3, No. 4, April, 1896.)
- Dr. Launcelot W. Andrews. (On a New Method for the Preparation of Pure Iodine; Science in its Relation to the Ethical Sentiments.)
- Dr. E. H. Ruediger. (Bacteriologic Study of the Blood in Thirty Cases of Clinical Typhoid Fever; the Production and Nature of Streptococcolysin.)

- Dr. Herbert E. Durham. (Some Notes on the Urine in Beri-beri; Notes on Beri-beri in the Malay Peninsula and on Christmas Islands, Indian Ocean.)
- Dr. Israel C. Russell. (Research in State Universities.)
- Dr. Hideyo Noguchi. (The Effects of Venom upon the Blood Corpuscles of Cold-Blooded Animals.)
- Drs. Heckel, de Cordmay, and Schlagenhauffen. (Sur un nouveau Copal et sur un nouveau Kino Fournis le premier par le Fruit et le second par l'Ecorce du Dipteryx Odorata Willd.)
- Dr. Ludvig Hektoen. (Linneas as a Physician; The Action of Certain Irons upon the Lysins in Human Serum; Recent Investigations bearing on Infectious Diseases of Unknown Etiology; Note on Typhoid Fever and Scarlet Fever with Special Reference to the Diagnostic Value of Blood Cultures.)
- Dr. George H. Weaver. (Bacteriologic Studies of the Skin and Throat in Cases of Scarletina; Vitality of Bacteria from the Throats of Scarlet Fever Patients; Cirrhosis of the Liver of the Guinea-Pig produced by a Bacterium (*Bacillus coli communis*) and its Products.)
- Dr. J. W. Jenks. (Report on English and Dutch Colonies in the Orient.)
- Carnegie Institution. (Desert Botanical Laboratory of the Carnegie Institution, Coville and MacDougal.)
- Mr. Elmer D. Merrill. (El Roble (*Quercus Jordanae* de la Flora de Filipinas, 1875.)
- Dr. W. E. Musgrave. (Subscription to Northwest Medicine for 1904.)
- Publishers of Schimmel's Semiannual Reports. (Reports for years 1896-1902, inclusive.)
- United States Government Departments as follows: Department of Agriculture: Bureau of Animal Industry, Bureau of Plant Industry, etc. War Department: Bureau of Insular Affairs; Office of Surgeon-General, United States Army; General Staff, United States Army; Philippines Division (maps). Coast and Geodetic Survey: Maps and charts. Treasury Department: Laboratory, Public Health and Marine-Hospital Service. Census Bureau, National Herbarium, National Museum, etc.
- Departments of the Government for the Philippine Archipelago. (Reports and Bulletins.)
- Presidents of most important American universities. (Registers and announcements.)
- Directors of agricultural experiment stations as follows: Alabama, Arizona, Arkansas, California, Cornell University, Florida, Hatch, Illinois, Indiana, Kansas, Michigan, Mississippi, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, Storrs, South Dakota, Tennessee, Texas, Vermont, Virginia, Wisconsin, Wyoming, West Virginia.

REPORT OF THE DIRECTOR OF THE BIOLOGICAL LABORATORY.

The following is the report of Dr. Richard P. Strong, Director of the Biological Laboratory, for the period from September 1, 1903, to August 31, 1904:

In the following report only a brief summary of the work performed during the past year has been attempted. During that time the scope of the laboratory has been widened and the various divisions more thoroughly organized.

(I) CLINICAL LABORATORY EXAMINATIONS.

This division of the work has been under the direction of Dr. W. E. Musgrave. It is regarded as the most important section of the routine work of the laboratory. As during the previous year, all the clinical laboratory examinations necessary for the Civil Hospital, the San Lazaro Hospital, Bilibid Prison, and the Board of Health have been performed, and in addition a number of examinations have been undertaken for private physicians. The number, nature, and results of the examinations are shown in the following tables. There has been a steady augmentation in the amount of clinical diagnostic work carried on by the laboratory during the past two years, it increasing from 3,816 analyses in 1902 to 6,535 in 1903, and finally to 30,830 in 1904. When one considers that this averages about 103 examinations for each working day of the year, it can be readily understood how much of the time of the laboratory force is occupied with this routine work. Attention has been called in previous reports to the great importance of these examinations and of the impracticability, particularly in tropical countries, of the physician making correct diagnoses and thus properly treating his cases without laboratory aid. In this connection, it seems advisable to call attention to the amount of clinical laboratory work performed for private physicians, for only in this has there been, during the past year, a decrease in the number of examinations requested. The reason is very obvious, for at the Government Laboratories a charge is made for each private examination, and many physicians have apparently either preferred to go to other laboratories in the city, where the work may be performed for a smaller sum, or where no charge is made; or, indeed, even to be content without laboratory examinations for their patients. Such a condition

of affairs seems unfortunate, since it is believed that the public would be more benefited if practicing physicians made greater use of the Government Laboratory in assisting them in the diagnosis of certain diseases. Therefore, it would seem advisable, at least for a time, to abolish this charge for clinical laboratory examinations for physicians.

During the year a number of cases of leprosy, in which the lesions of the disease were not sufficiently definite for a diagnosis to be made, or in two cases even suspected, have been detected with certainty by bacteriological examinations.

(II) PATHOLOGICAL WORK.

This section of the work has been placed under the direction of Dr. M. Herzog since February, 1904. It includes the examination of all tissues for tuberculosis, leprosy, syphilis, etc., or of tumors or other pathological specimens sent to the laboratory for diagnosis.

The amount of this work performed for the various Government institutions is gradually increasing. An interesting fact in connection with these examinations may be mentioned that of a total of 13 appendixes removed and sent to the laboratory for examination for amebæ only one was found to contain these parasites. During the year there have been 271 autopsies performed (an increase of 71 over the previous year) for the Board of Health, the Civil Hospital, and Bilibid Prison. In Table V the necropsies are classified. Records are kept of all the autopsies performed which, apart from their statistical value, have proved of great importance to the Government in several medico-legal cases. These post-mortem examinations have also been of considerable assistance to the Board of Health in their endeavor to control infectious diseases, such as plague and Asiatic cholera, since many persons who have succumbed to them and who have not been seen by a competent physician during life are found dead in their houses, and in such cases a diagnosis is frequently impossible without an autopsy. Bacteriological examinations are made in cases of death from infectious diseases.

The pathological museum is gradually increasing in size and value. At present 325 specimens illustrating various lesions of tropical diseases are on hand. The preparations, as a rule, have been preserved in Kaiserling's solution. Apparently much greater care in protection from light is necessary in the Tropics than in temperate climates in order to prevent the fading of colors in specimens preserved in this liquid. The task of preserving and caring for the museum specimens has been given to Mr. F. H. Willyoung, who, in addition, has performed almost the entire histological work of the laboratory. There has been a great increase in the latter during the year—nearly 3,000 sections have been cut, mounted, and stained. Almost all of the imbedding is done in paraffin, cellodoin being used only occasionally in certain diagnostic work. In the Tropics one can not rely upon small, spray-freezing machines for

quick sectioning, since their use is frequently impracticable because of the temperature. The large carbon-dioxide tubes are necessary; but sections obtained here by freezing in this manner are often unsatisfactory—and, indeed, the members of the laboratory have practically given up the use of frozen sections. It is probable that we may be able to conduct this class of work more satisfactorily when the cold-storage rooms are completed.

Considerable difficulty is experienced in dehydrating sections, because of the great humidity during certain seasons of the year, and at times it is practically impossible thoroughly to accomplish the desired result, for the sections immediately take up moisture from the air. It has also been noticed that stained sections (protected from light) show a tendency quickly to fade in Manila, and a similar complaint has come to me from Dr. Bell, of the bacteriological laboratory in Hongkong. It has been supposed that this was due to an acid reaction of the Canada balsam which the high temperature, combined with moisture, produces. I recently examined the reaction of specimens of balsam on each desk in the Biological Laboratory and in every instance obtained a marked acid reaction. In sections stained with methylene blue and eosin the trouble may be due to improper dehydration. In the short time required in mounting, the sections, after thorough dehydration, will sometimes absorb enough moisture from the air to dissolve out the methylene blue.

(III) HYGIENIC WORK.

The work in this section has included numerous bacteriological analyses of drinking waters, both from the city supply and from other parts of the Archipelago; the examination of waters from various mineral springs; of bottled commercial waters offered for sale; of bottled lemonade, etc.; of well waters suspected of contamination by the Board of Health, etc.; and in addition many bacteriological analyses of milk have been made. The work in this division, besides miscellaneous examinations, has included the study of various disinfectants, and the examination of rats for infection with *bacillus pestis*, etc.

The bacteriological analyses of the city water supply have been carefully carried on since December, 1903. The results are tabulated in Table VI. They have been performed almost entirely by Mr. Moses T. Clegg, assistant bacteriologist. In my annual reports of the years 1902 and 1903 I discussed the question of the city water supply and pointed out the danger of using this water for drinking purposes unless it was thoroughly boiled and filtered. Attention was called to the fact that *sarkodina* (amebæ) and *mastigophora* were present in this water; and in 1902 I pointed out that in the examination of the city water supply “amebæ and several varieties of *sarkodina* were frequently cultivated in large numbers. Amebæ were grown in about one or two out of every four or five examinations.” During the past year Dr. W. E. Musgrave, pathol-

ogist of this laboratory, has confirmed these results and has prepared a special media in which amebæ in symbiosis with bacteria may be more easily cultivated. He has made numerous analyses of samples taken from the water supply throughout its entire length with the view of determining the presence or absence of these micro-organisms, and he has found that they may be cultivated from water secured at all points along the Mariquina River. While the existence of these micro-organisms in the supply of the city of Manila was pointed out in 1902, the evidence of their pathogenicity was not at that time demonstrated. During the past year Dr. Musgrave has carried on extensive experiments by feeding encysted forms of amebæ cultivated from the city water supply, and has shown that at least one variety of these *sarkodina* are pathogenic, since after feeding to monkeys the encysted cultures growing in symbiosis with saphrophytic bacteria for prolonged periods of time, infection and amebic enteritis was produced in a certain proportion of the animals. In order to obtain a correct idea of his work, which is too lengthy to be considered in detail here, one should peruse his valuable article prepared with Mr. Moses T. Clegg on this subject, entitled "Amebas: Their Cultivation and Entiologic Significance," and which will shortly appear as Bulletin No. 18, Biological Laboratory, Bureau of Government Laboratories. If one needed an additional warning in regard to the danger of contracting amebic dysentery from the use of the city water supply for drinking purposes, it would seem that Musgrave's experiments would certainly supply it.

On March 2, 1904, I was informed by the Superintendent of Government Laboratories that an expedition, consisting of the City Engineer and his assistants, would go to the source of the Mariquina River above Montalbon for the purpose of an inspection of the source of the proposed new city supply, and in order to secure a bacteriological examination Dr. Musgrave was requested to accompany the party and collect specimens of water at the source and at intervals along the water supply¹ and to perform the necessary bacteriological analyses. I quote from Dr. Musgrave's report of this trip as follows:

Samples of water for culture for both bacteria and protozoa were taken just below the junction of the two streams which form the Mariquina River, at the site of the new dam, and at Montalban, San Mateo, and Santolan. * * * The sample for colony counts taken at the head of the river was unfortunately contaminated; for the others the numbers of bacteria were as follows:

	Per cubic centimeter.
From the site of the new reservoir.....	208
From the river just below Montalban.....	377
From the river just below San Mateo.....	105
From the present intake at Santolan.....	267
From the tap in city.....	194

¹Mr. Thanisch, of the Chemical Laboratory, was also present and secured samples for chemical analysis.

These counts were carefully made from a large number of plates and represent quite accurately the bacteria in the samples taken. I can not satisfactorily explain the low count in the sample from San Mateo. Some growth may have occurred during the twelve to eighteen hours between the time the samples were taken and the time plates were made, notwithstanding they were kept packed on ice during this time. No classification of the bacteria has been attempted. They are for the most part very free-growing organisms, and a considerable number are pigment producers. One of these latter, which has been found in all the plates, is a large yellow pigment-producing bacillus, not pathogenic for laboratory animals, but which has been found a most uniformly satisfactory symbiotic organism for the cultivation of amebas in artificial media. Cultures for amebas made from the same places as the bacteria (already mentioned), and, in addition, one from the head of the Mariquina River, all showed numerous amebas after the usual length of time, and some of these protozoa are now being further worked out. I know of no satisfactory method of determining actual numbers of amebas as in the case of bacteria, but they are apparently quite numerous throughout the water course. From a sanitary standpoint there can be no question of doubt about the advisability of changing the source of the water supply, and the judgment shown in the selection of the proposed new site is equally apparent. * * *

The proposed new site for the water supply is free from many of the objections to the present one, and is on the whole probably as satisfactory a location as could be found within a reasonable distance of Manila. The valley is narrow and the mountains high and steep on both sides. There are but few animals and very little human traffic in the region. There is, however, considerable vegetation, and a small town, Bosoboso, is situated on one branch a few miles above the proposed reservoir. As much as possible of the vegetation and all animal life should be removed from the entire watershed to bring the city supply within the bounds of probable safety. With ordinary precautions the danger from bacteria in a water supply obtained from the proposed location would probably be very remote. In furnishing a safe supply to Manila, however, another factor as important as the bacteria should be considered. Amebas play an important rôle in the invalidism of the city's population, and it has recently been shown in the laboratory that some of the pathogenic amebas are found in the present water supply. I do not affirm that all amebas are pathogenic, but at the present time no practical means are known by which the pathogenic ones may be separated. The only safe sanitary deduction is, therefore, to regard them all as dangerous. It has already been shown in this report that the water above the new proposed reservoir contains these parasites, and they must therefore enter into our consideration. To limit the danger from amebas in the supply, one or both of two methods suggest themselves: First, limit the number of amebas and bacteria in the reservoir by removing all possible organic matter from the watershed; second, accomplish the same result or reinforce the first by a method of filtration. Recent unpublished work in this laboratory by Mr. Clegg and myself has shown that within certain limits amebas are adaptable; and that this varying degree of pathogenicity is influenced by the environment of the protozoa. It is apparently increased by passage through the animal organism and it is likely also to be influenced by the class of bacteria and other substances with which it may be associated. This work has progressed far enough to indicate that the farther and longer they are removed from animal organic matter, and possibly from some bacteria quite common in man, the less will be the likelihood of the amebas being pathogenic to human beings on direct inoculation. This statement is offered as an additional reason for a complete removal of animal life from the proposed new watershed. * * *

In closing I wish to emphasize that provisions for a safe water supply for Manila must

include methods for removal of animal parasites which are present in the Mariquina River and its tributaries.

The City Engineer, having recognized that it would be of importance to carry on experiments with the idea of excluding amebæ from the water supply by a system of filtration, prepared some experimental filters. So far they have shown themselves entirely inadequate to remove these micro-organisms from the water. I personally believe that it is impracticable to free the general water supply of these *sarkodina*, and, however interesting experiments with this end in view may seem, I do not believe that the city water here can be purified by general filtration so that it will be advisable for Americans or Europeans to drink it unless it has been sterilized in some way. It therefore is very necessary for us, at least for the present, to direct our efforts toward convincing the people that the unsterilized water is unsafe for drinking purposes.

Since a great number of the American and European inhabitants have become so afraid of using the city water either as it flows from the tap or after it has been boiled for drinking purposes, on account of the danger of its becoming again infected, many individuals have entirely abandoned its use and have instituted bottled waters. A number of these have been submitted to the laboratory for bacteriological diagnosis, either by the companies promoting their sale or by the Board of Health. As a result of these analyses some have been condemned as unfit for use.

In the hygienic section of the laboratory the examination of rats, submitted by the Board of Health, for infection with *Bacillus pestis* has been performed. This work has been carried on by Mr. Charles B. Hare. During the present year no rat has been found infected with this organism. In a few cases bacilli resembling morphologically those of plague were found present, but a further examination by culture and animal inoculation showed them to be other organisms. During the previous year the percentage of rats found infected with *Bacillus pestis* was one-sixteenth of 1 per cent.

(IV) ANIMAL DISEASES.

The large importation of cattle made by the Government for the purpose of restocking the Islands with draft animals has necessitated the frequent examination of these animals for various diseases which were either present in the animals or which developed later among them. About 9,000 blood examinations of carabaos for surra have been performed during the year, of which 1,000 were positive. The total number of examinations for trypanosomiasis during the year was 9,569, of which 1,123 revealed the parasite. The importance of immediate examination of all imported carabaos will be recognized when the fact is considered that on one occasion an animal suffering with trypanosomiasis was discovered on the lighter conveying the animals from the ship to the shore; it could only have contracted the disease in China.

Among other diseases existing in Manila that have been brought to light among animals during the year are a number of cases of Texas fever. These cases have been studied and report of them made by Dr. J. W. Jobling, formerly Director of the Serum Laboratory, and Dr. P. G. Woolley, at that time pathologist in this laboratory. (See Bulletin No. 14, Biological Laboratory, Bureau of Government Laboratories.) A number of the imported cattle died after arriving in these Islands, and many autopsies were performed in order to determine the cause of death. Hemorrhagic septicaemia seemed to be a common disease among the animals at first imported. The investigation of these animal diseases in and about the city of Manila, so far as they were studied in the Biological Laboratory, were carried on chiefly by Dr. P. G. Woolley, who was transferred to the Serum Laboratory in February, 1904. However, the laboratory has in addition on a number of occasions, when requested, sent members of its staff to other portions of the Archipelago for the proper investigation of epidemic diseases of animals. Thus, in January, 1904, Mr. F. H. Willyoung was directed to proceed to Bacolod, Occidental Negros, for the purpose of determining the number of diseased animals among the Government the carabaos at that place in herds known to be infected with surra. He found that of 2,093 examinations repeated on the same animals 257 were positive.

In October, 1903, upon the repeated and urgent requests of Mr. Roxas for aid in relation to a disease which was rapidly destroying the live stock on his estate in Masuhbu, Dr. W. E. Musgrave and Mr. F. H. Willyoung were requested to visit this place and investigate. They found that many of the carabaos had been affected with rinderpest, and that of 320 of these animals 140 had died of this disease. Out of 66 native ponies 14 had died of surra, and a number of other horses were suffering from pseudofarcy.

In May of this year Drs. M. Herzog and W. B. Wherry were requested to make recommendations in regard to the disposition of some Government carabaos suffering with surra at Malolos. In this connection Dr. Herzog made some interesting observations to the effect that in 43 carabaos, which represented the remnants of a herd of 100, six of these 43 (of which the remaining individuals were infected with surra) never contracted the disease, as shown by numerous and repeated blood examinations extended over a period of about six months. These observations suggested the possibility of a natural immunity for certain carabaos against the disease. On the other hand, a number of animals had been infected for several months with trypanosoma, and in spite of this fact they were in a very fair physical condition and able to perform the work of healthy carabaos.¹

¹ See the report of the Director of the Serum Laboratory in respect to surra in the Negros herd.

A number of bacteriological examinations for glanders in horses which had responded to the mallein test have been performed during the year for the United States Army, and a number of examination of horses for pseudofarey (blastomycetic) infection have also been carried on. A few carcasses of pigs which had died of hog cholera have been received at the laboratory for diagnosis during the year.

(V) ENTOMOLOGICAL.

The entomological work has been carried only by Mr. Charles S. Banks, entomologist, and Mr. W. Schultze, assistant entomologist.

After his study of insects of the cacao Mr. Banks occupied himself chiefly with the arrangement and preparation of the entomologic exhibit for the St. Louis Exposition.

At the time of the discovery of cases of Texas fever in cattle in Manila Mr. Bangs was requested to examine these animals for ticks, and obtained a number of specimens which he identified as *Boophilus australis* Fuller, the Australian cattle tick capable of transmitting Texas fever. He has given a careful description of these ticks with numerous illustrations in Bulletin No. 14, Biological Laboratory, Bureau of Government Laboratories.

After his departure with the laboratory entomological exhibit for the St. Louis Exposition, in January, the entomological work was carried on by Mr. Schultze, who has prepared for me the following brief summary of the year's work in this department:

A large number of insects (about 1,500), which were previously preserved in alcohol, have been permanently pinned, mounted, and arranged. These specimens include *Coleoptera*, *Hemiptera*, *Lepidoptera*, etc. Most of the insects of the collection have been classified and a card catalogue system has been introduced, containing the usual information in regard to date of collection, place where found, etc.

Insects (fifteen different species), particularly *Lepidoptera*, have been bred with a view of studying their life history. Some interesting observations and experiments with *Attacus atlas* in parthenogenesis have been made. Drawings of about 30 insects intended for future publications have been completed and quite a number of new species have been either partly or completely described. Special attention has been paid to economic entomology throughout the year.

During the week of October 16 to 23, 1903, an expedition was made into the Province of Laguna to study and collect insects damaging the cocoanut tree. A second one into the Province of Laguna for the same purpose was undertaken between July 26 and August 1, 1904. Three distinct species were found infesting the cocoanut trees in Pasayan and in Magdalena, and several new ones were also discovered which were evidently doing great injury to these trees. A study has been made of the habits and life character of these insects. During this trip specimens of an insect injurious to the cotton tree were also obtained. This individual belongs to the *Cerambycidae* family. Samples of cotton and cocoanut trees showing the results of the destruction were obtained for the laboratory collection.

Upon the suggestion of the Director of the laboratory there has been taken up the collection and study of *Culicidæ*, and some new species have been discovered which will shortly be fully described. In connection with the investigation of the rôle that insects play as plague carriers, a new species of rat flea has been encountered.

There are now on hand in the entomological section over 3,300 different insects of both classes, arranged and classified in permanent boxes. Of these a very large number (several hundred) are new and hitherto undescribed species. Two thousand of the specimens are *Coleoptera*, and the remaining number comprise the other classes. The material still contained in alcohol and not yet classified and arranged consists of from 7,000 to 8,000 insects.

(VI) RESEARCH.

In spite of the large amount of routine work, a number of original investigations have been pursued. An attempt has been made to give each worker the entire material obtainable relating to his subject—thus, Dr. Musgrave, who has undertaken work regarding the biology of amebæ and of amebic dysentery, has had placed at his disposal practically everything relating to these subjects which has come into the jurisdiction of the laboratory during the past year. A similar policy has been pursued in regard to the study of bubonic plague by Dr. Herzog and with Dr. Woolley in regard to the investigation of cattle diseases, etc.

ANIMAL DISEASES.

In the annual report of the laboratory for 1903 reference was made to Dr. Woolley's study of hemorrhagic septicæmia in the herds of imported carabaos. During the present year he has continued these studies and has reported on "Some Pulmonary Lesions Produced by the Bacillus of Hemorrhagic Septicæmia of Carabaos." (Bulletin No. 12, Biological Laboratory, Bureau of Government Laboratories.)

In his first case the lesions found in the lungs were so like those of peri-pneumonia that he was at some loss to make a positive diagnosis until careful pathologic and bacteriologic examinations had been made. However, the organism of hemorrhagic septicæmia was isolated from the heart's blood and from the lungs, and hence there was no doubt as to the nature of the disease. Woolley regards this case as one of pure infectious pleuro-pneumonia.

In a further study of the diseases afflicting carabaos in these Islands Woolley encountered in one of his necropsies an interesting bacterium, which he has described as *Bacillus violaceus manilæ*, a pathogenic micro-organism. (Bulletin No. 15, Biological Laboratory, Bureau of Government Laboratories.) The bacillus was found to be markedly pathogenic for guinea pigs and rabbits. When inoculated subcutaneously into mon-

keys, cats, dogs, and a calf it produced abscesses. Subcutaneous injections into guinea pigs and rabbits produced extensive areas of necrosis at the point of inoculation, hemorrhagic infarcts in the lungs, and milliary abscesses in the spleen and liver.

Reference has already been made to the discovery of cases of Texas fever among the cattle imported into the Islands and to the identification and description of the ticks found on these animals. Mr. Banks's description of the ticks was published in Bulletin No. 14, Biological Laboratory, Bureau of Government Laboratories. A report on the experimental work upon the subject of Texas fever was also made by Drs. J. W. Jobling and P. G. Woolley, which will be discussed under the report of the Serum Laboratory.

BUBONIC PLAGUE.

In connection with their work on bubonic plague, Dr. M. Herzog, pathologist, and Mr. Hare, assistant bacteriologist, have investigated the question of whether latent or dormant plague exists in places where the disease is endemic.¹

They obtained cultures from the blood of 245 individuals, consisting of native Filipinos and Chinamen, an effort being made to examine those who were particularly exposed to plague infection. From none of the cases were plague bacilli isolated, and Dr. Herzog and Mr. Hare concluded that latent plague with the presence of plague bacilli in the circulating blood, in the absence of clinical symptoms, does not exist.

While engaged in his plague studies Dr. Herzog encountered a case which had supposedly died of this disease. However, at necropsy no lesions of plague were found and the bacillus of pest was not isolated. Instead, a bacillus was obtained which on all culture media produced an intense golden-yellow pigment. Dr. Herzog named this organism *B. aureus fatidus*. He regards this bacillus as one which is probably not very pathogenic under ordinary conditions, and which, as a rule, is a harmless saprophyte but which may become parasitic under certain circumstances and lead to a fatal issue. (See Bulletin No. 13, Biological Laboratory, Bureau of Government Laboratories.)

CHOLERA.

Dr. Wm. B. Wherry, bacteriologist of the laboratory, has pursued a study of some of the biological properties of the cholera spirillum. After making a careful preliminary study of the variations which occurred in one strain of cholera spirilla, he compared it with other cultures of this organism from different sources. His work will shortly appear in Bulletin No. 19, Biological Laboratory, Bureau of Government Laboratories.

¹ Bulletin in press.

AMEBIC DYSENTERY.

Dr. Musgrave, senior pathologist of the laboratory, has throughout the year devoted himself to the study of this subject, and has pursued extensive and important experiments relating to the cultivation and etiologic significance of amebæ. With the assistance of Mr. Moses T. Clegg, assistant bacteriologist, he has prepared a bulletin on this subject. (No. 18, Biological Laboratory, Bureau of Government Laboratories.) It is regretted that space forbids the consideration of this article in detail. They concluded that amebæ are the etiologic factors in the disease generally known as amebic dysentery, and that by following the methods described in their paper such amebæ may be grown on artificial media and the disease reproduced in monkeys and man by the ingestion of these cultures. Amebæ may be reclaimed by culture from the stools or the intestinal ulcers of the inoculated animal. Dr. Musgrave has in addition prepared a valuable paper on the treatment of amebic dysentery which will appear as Part II of this same bulletin (No. 18).

STUDIES IN IMMUNITY.

During the year the Director has devoted a portion of his time to the study of certain problems in immunity. Experimental work upon protective inoculation against Asiatic cholera has been continued, and a prophylactic against this disease has been prepared, which when injected into man causes practically no local reaction and only very slight general manifestations. By a single subcutaneous inoculation into man of this prophylactic, a bactericidal immunity of from 0.33 to 0.25 milligram has been obtained—that is, 0.33 to 0.25 milligram of the sera of the inoculated individuals will protect a guinea pig against ten times the dose of living spirilla, fatal for these animals. (See Bulletin No. 16, Biological Laboratory, Bureau of Government Laboratories.)

Work upon a more satisfactory preparation of prophylactic against bubonic plague has also been commenced in the Biological Laboratory. In connection with these problems in immunity the Director has also completed an experimental study upon "Some Questions Relating to the Virulence of Micro-Organisms, with Particular Reference to their Immunizing Powers." A consideration of this subject and the results of the experimental work will appear shortly as a bulletin from this laboratory.

SKIN DISEASES.

During the year some attention has been given by the Director to the contagious skin infections occurring in the Philippine Islands, and cases

of tinea imbricata, microsporon furfur, and of yaws have been found in Manila and studied both clinically and microscopically. These investigations will also shortly appear as bulletins from the laboratory.

SMALLPOX.

Drs. Brinckerhoff and Tyzzer, of Harvard University, who are at present guests of the laboratory, have devoted their attention to certain problems in variola and vaccine since their arrival in the Philippine Islands eight months ago. Their work is not yet ready for publication, but will probably appear some time during the autumn of the present year.

Appended are the tables showing the number and character of the routine examinations performed by the laboratory:

TABLE I.—*Tabulated statement of the clinical laboratory examinations performed during the year.*

[Positive = Examinations showing organisms. Negative = Examinations showing absence of organisms.]

Character of examination.	Civil Hospital.			Bilibid Prison.			Private physicians.		
	Positive.	Negative.	Total.	Positive.	Negative.	Total.	Positive.	Negative.	Total.
Sputum	39	173	212	48	233	281	11	18	29
Blood for malaria	23	163	186					6	6
Blood counts			366						4
Blood for serum reactions	4	46	50				11	6	8
Blood, miscellaneous			4						
Gonococci	16	27	43						
Feces			1,476			62			22
Total	82	409	2,337	48	233	343	22	30	69

Character of examination.	Board of Health.			Police surgeon.			Total other institutions.	Total.		Grand total.
	Positive.	Negative.	Total.	Positive.	Negative.	Total.		Positive.	Negative.	
Sputum								98	424	522
Blood for malaria				2	7	9		25	176	201
Blood counts										370
Blood for serum reactions								6	52	58
Blood, miscellaneous										4
Gonococci	1,487	14,593	16,080					1,503	14,620	16,123
Feces						27				1,587
Pseudo-farcy			11							11
Glanders			3							3
Surra	1,123	8,446	9,569					1,123	8,446	9,569
Necropsies			271							271
Rats for plague			1,905							1,905
Waters, lemonades, etc.			33				32			65
Miscellaneous										141
Total	2,610	23,039	27,862	2	7	36	32	2,755	23,718	30,830

TABLE II.—*Blood examinations.*

Character of examination.	Civil Hospital.						Police surgeon, foreign.		
	Native.			Foreign.			Positive.	Negative.	Total.
	Positive.	Negative.	Total.	Positive.	Negative.	Total.			
Erythrocytes count.....			5			13			
Erythrocytes count (differential).....						2			
Leucocytes count.....			55			282			
Leucocytes count (differential).....			5			4	2		
Malaria.....	4	33	37	19	130	149	2	7	9
Tertian.....	3			9					
Æstivo-autumnal.....				10					
Quartan.....	1								
Serum reactions.....			10	4	35	40			
Typhoid fever.....				4					
Malta fever.....					1				
Miscellaneous.....						4			
Total.....			102			494			9

Character of examination.	Private physicians.					Total.						Grand total.
	Native.			Foreign.		Native.			Foreign.			
	Positive.	Negative.	Total.	Negative.	Total.	Positive.	Negative.	Total.	Positive.	Negative.	Total.	
Erythrocytes count.								5			13	18
Erythrocytes count (differential)											2	2
Leucocytes count			2		1			57			283	340
Leucocytes count (differential)					1			5			5	11
Malaria		4	4	2	2	4	37	41	21	118	160	201
Tertian						3			11			
Estivo-atumnal									10			
Quartan						1						
Serum reactions	2	5	7	1	1	2	15	17	4	37	41	58
Typhoid fever	2					2			4			
Malta fever										1		
Miscellaneous											4	4
Total			13		5			115			508	624

TABLE III.—*Sputum examinations for tubercle bacilli.*

For whom examined.	Native.		Foreign.		Total.
	Positive.	Negative.	Positive.	Negative.	
Civil Hospital.....	23	85	16	88	212
Bilibid Prison.....	48	225		8	281
Private physicians.....	7	13	4	5	29
Total.....	78	323	20	101	522

TABLE IV.—*Examinations of feces.*

Parasites.	National- ity.	Civil Hos- pital.	Bilibid Prison.	Private physi- cians.	Police surgeon.
Amebæ -----	{Native -----	32	15	2	3
	{Foreign -----	268	7	9	18
Monads -----	{Native -----	28	7	2	3
	{Foreign -----	118	5	5	2
Strongyloides intestinalis -----	{Native -----	5	5	1	
	{Foreign -----	1	1		1
Ova trichocephalus dispar -----	{Native -----	22	12	2	1
	{Foreign -----	26	2	4	
Ova uncinaria duodenale -----	{Native -----	24	6	2	
	{Foreign -----	23	2	1	
Ova ascaris lumbricoides -----	{Native -----	18	10	1	1
	{Foreign -----	24	2	1	1
Ova tænia -----	{Native -----	3			
	{Foreign -----				
Balantidium coli -----	{Native -----	2	1		
	{Foreign -----	1			
Megastoma entericum -----	{Native -----		2		
	{Foreign -----	1		1	
Oxyuris vermicularis -----	{Native -----		3		
	{Foreign -----		3	1	
Tænia, trichocephalus dispar, strongyloides, uncinaria, and ascaris.	{Native -----	3			
	{Foreign -----				
Amebæ, strongyloides and tænia -----	{Native -----	1			
	{Foreign -----				
Amebæ, monads, uncinaria, and ascaris -----	{Native -----	3	2		
	{Foreign -----				
Ascaris, monads, amebæ, and trichocephalus dispar.	{Native -----	4	1		1
	{Foreign -----				
Strongyloides, trichocephalus dispar, and uncinaria.	{Native -----	2	1	1	1
	{Foreign -----				
Trichocephalus, dispar, uncinaria, and as- caris.	{Native -----	1	2	1	
	{Foreign -----				
Ascaris, lumbricoides, and uncinaria -----	{Native -----				
	{Foreign -----	8	1	1	2
Amebæ and monads -----	{Native -----	4		1	
	{Foreign -----	38	3	1	1

Total examinations (1,587): Native, 226; foreign, 1,361. Total positive amebas: Native, 62; foreign, 302.

TABLE V.—*Necropsies.*

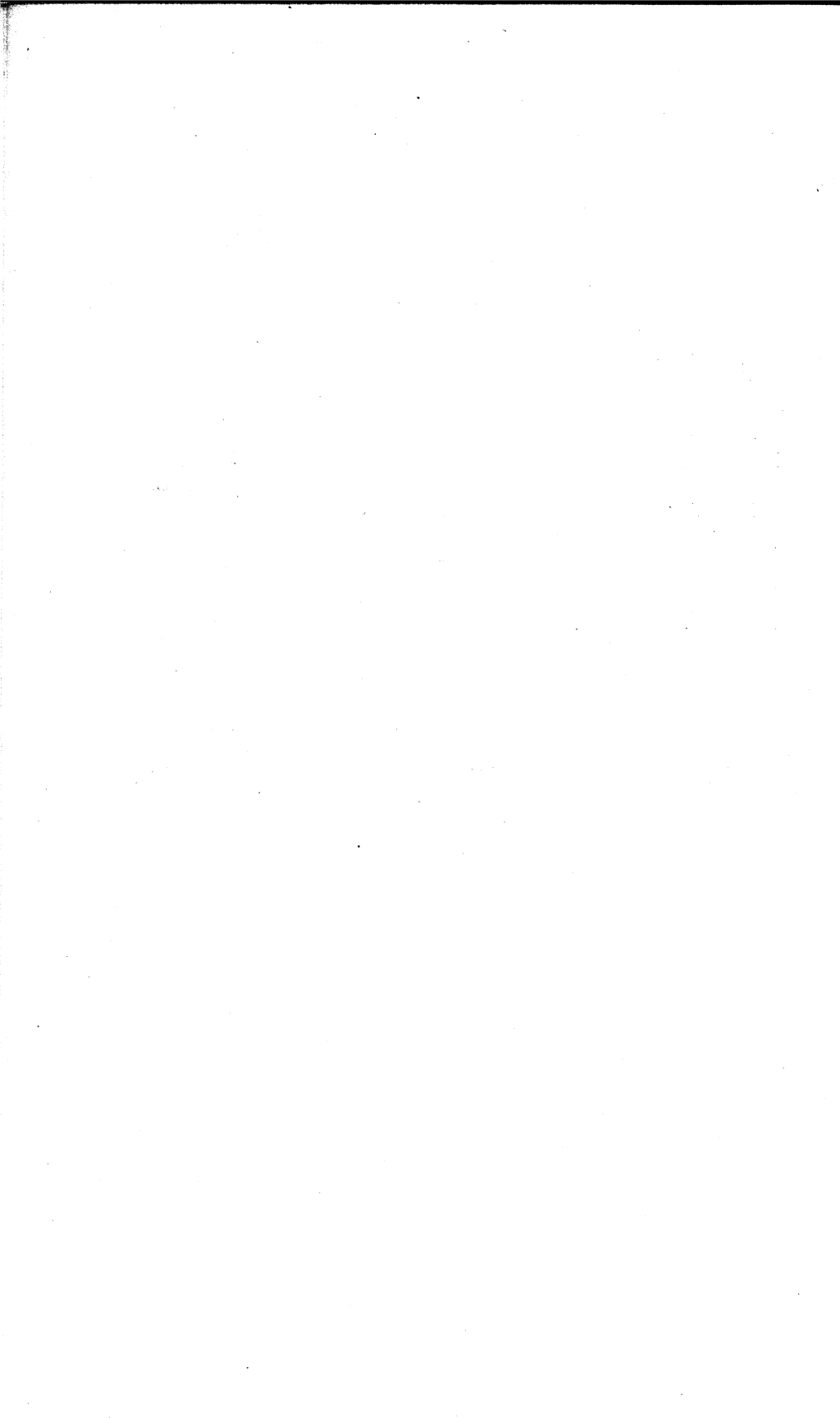
Disease.	Number.	Disease.	Number.
Bubonic plague -----	53	Glanders -----	2
Asiatic cholera -----	38	Tetanus -----	1
Amebic dysentery -----	15	Typhoid fever -----	1
Acute bacillary dysentery -----	2	Nephritis (various forms) -----	20
Enteritis (various forms) -----	10	Carcinoma -----	3
Beri-beri -----	6	Aneurysm -----	2
Leprosy -----	5	Drowning -----	5
Pernicious malaria -----	2	Trauma and hemorrhage (accidental or suicide) -----	8
Smallpox -----	19	Miscellaneous -----	33
Lobar pneumonia -----	27		
Tuberculosis -----	29		
Septicæmia -----	6	Total -----	287

TABLE VI.—*Bacteriological examinations of water supply for the city of Manila and vicinity.*

Date.	Source of collection.	Submitted by—	Number of micro-organisms to 1 cubic centimeter.	Amebas.
1903.				
Dec. 14	Hydrant ¹ -----	Board of Health-----	400	
Dec. 21	do ¹ -----	do-----	550	
Dec. 28	do ¹ -----	do-----	600	
1904.				
Jan. 1	do-----	do-----	460	
Jan. 1	do-----	do-----	250	
Jan. 18	do-----	do-----	200	
Jan. 25	do-----	do-----	200	
Feb. 1	do-----	do-----	150	
Feb. 8	do-----	do-----	125	Present.
Feb. 15	do-----	do-----	150	Do.
Feb. 23	Deposito-----	do-----	120	Do.
Feb. 29	Mariquina River-----	do-----	112	Do.
Mar. 7	Hydrant-----	do-----	(²)	Do.
Mar. 7	Mariquina River-----	do-----	208	Do.
Mar. 7	do-----	do-----	105	
Mar. 7	Hydrant-----	do-----	267	Do.
Mar. 14	do-----	do-----	120	Do.
Mar. 11	do-----	do-----	108	Do.
Mar. 25	do-----	do-----	125	Do.
May 9	do-----	do-----	175	Do.
May 23	do-----	do-----	130	Do.
June 6	do-----	do-----	206	Do.
June 20	do-----	do-----	135	Do.
July 5	do ³ -----	do-----	450	Do.
July 15	do ³ -----	do-----		Do.

¹ Following rains.² Contaminated.³ After rains.

A series of examinations of water after passing through various filters has also been performed for the City Engineer, and in all of the filters amebæ were present. The bacteriological counts of micro-organisms varied from 150 to several thousand per cubic centimeter, according to conditions of filters.



REPORT OF THE CHEMICAL LABORATORY.

The following is the report of the Chemical Laboratory, compiled by Dr. A. M. Clover, chief of the economic products division:

ROUTINE WORK.

The routine work of the Chemical Laboratory has consisted mainly in making analyses for the different Departments of the Government, and also for private persons whenever requested. A classified list of these analyses is given, which will show the amount and variety of this work, the number made having increased to nearly double that of the preceding year. The important items in this work are as follows:

Analyses for the Civil Hospital for clinical purposes; of various substances for the custom-house, to determine their classification under the tariff and to detect adulterations; of soils and other agricultural products for the Bureau of Agriculture; of minerals for the Mining Bureau; of waters, chiefly for the Board of Health, and of soils for the Forestry Bureau. A number of examinations connected with criminal proceedings, involving the detection of poisons in the stomach, blood stains, etc., and analyses of a great variety of products for private persons have been completed; indeed, nearly all the Departments of the Government have had occasion to call upon the Chemical Laboratory for more or less analytical work. Other work, not analytical, has been undertaken, principally for the offices of the Government—for example, the standardizing of various instruments, the distillation of oil in vacuum, the carrying out of experiments concerning questions such as the use of carbolic acid in disinfecting and of chemicals for protecting wood against attack by ants; also an investigation concerning the explosion of gunpowder with fatal results at Mariveles. In addition the laboratory has frequently been called upon to render opinions on questions within its domain.

The laboratory has from time to time made various analyses of interesting products which have been brought to its attention through various sources. A careful record has been kept of such work in order to preserve it for future reference. In the table this class is placed under the heading of analyses made for the Bureau of Government Laboratories.

In some cases work or analyses asked for were of so peculiar a nature as to necessitate the devising of special methods and the construction of special apparatus.

The toxicological and other criminal work has often taken a considerable amount of time, and it has been necessary for the chemist who undertook the examinations frequently to appear in court and to give testimony.

Table of analyses.

Article.	Board of Health.	Bureau of Agriculture.	Bureau of Government Laboratories.	Ethnological Survey.	Civil Hospital.	Custom-house.	Exposition Board.	Forestry Bureau.	Insular Purchasing Agent.	Mining Bureau.	Private.	Secret Service.	Bureau of Architecture.	Bilbid Prison.	Police Department.	Other Government institutions and officers.	Total.
Alcohols								3	3		2						8
Assays							16			10	108						134
Beverages						2					6					3	11
Coals			17						8	10	6					3	44
Criminal (not poison)												5					5
Foods and food-stuffs	1	29			1	8					2						41
Fertilizers		4	2							1	6						13
Metals and alloys				3		22				3	3					10	41
Medicines			2						3								5
Minerals			13	4				1		14	1					7	40
Oil			2	4		6			12		4		2			1	31
Paints, varnishes, colors, etc.						137		1	3		1		1				143
Toxicological	1		3													4	8
Soils		63						26					1			6	96
Textiles						4											4
Urnines			6		449						33			99	18		605
Waters:																	
Mineral	3		1														4
Sanitary	27		4					1			1					1	34
Resins							4	2			2						8
Proprietary articles						8											8
Gastric juice			1		7												8
Miscellaneous		8	3	1		13		7			10					2	44
Total	32	106	56	8	457	200	20	41	29	38	185	5	4	99	18	37	1,335

The laboratory has continued to manufacture acetozone in sufficient quantity to be able to supply all demands made upon it for this substance.

MINERALS.

The character of the minerals submitted for analysis have varied widely, the specimens including the oxides of iron (haematite, limonite, magnetite), the various sulphides of copper and iron (chalcocite, chalcopryrite, pyrite), as well as quartz. A number of samples of concentrates have also been examined and a few of galena have been assayed for silver.

GOLD.

During the last year the greater number of samples of gold-bearing mineral have come from two provinces—Benguet and Masbate. With reference to the values obtained, it may be said that they vary to a great extent. The majority are negative, so far as commercial quantities of

gold are concerned, but it is noticeable that relatively few samples contain absolutely no gold, almost all having at least an unweighable trace or "color" of gold. Some of the higher values are, \$60.36, \$40.64, \$88, \$49.61, \$87.65, and \$246, all from Benguet. One sample from a rich pocket in Benguet showed an assay of a little less than \$5,000. (All the above values are in United States currency.) Good values have also been obtained from the ores of Masbate.

SILVER.

This metal has not yet been found in commercial quantities.

PLATINUM.

The first platinum ever definitely identified in the Islands, so far as the records either of this or of the Mining Bureau show, was recently separated in the laboratory from some magnetic sand obtained from Rizal Province. In 5.96 grams of sand 25.88 milligrams of platinum was found.

COPPER.

Some of the assays of copper are very high, running between 40 and 50 per cent of metallic copper.

COAL.

The following are typical analyses of samples of coal submitted:

Analysis of coal from the Island of Batan.

Constituent elements.	(1)	(2)	(3)	(4)	(5)
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Moisture.....	6.3	6.4	6.5	2.4	2
Volatile combustible.....	39.4	39.7	40.6	39.4	41.7
Fixed combustible.....	46.8	46.5	46	47	42.6
Ash.....	7.5	7.4	6.9	11.2	13.7
Total.....	100	100	100	100	100
Sulphur.....	.53	.45	.60	2.1	2.6

None of the above showed coking properties. The following are also from Batan:

Constituent elements.	(1)	(2)
	<i>Per cent.</i>	<i>Per cent.</i>
Moisture.....	6.9	9.4
Volatile combustible.....	36.9	38.5
Fixed combustible.....	40	43.8
Ash.....	16.2	8.3
Total.....	100	100

The following are from Cebu :

Constituent elements.	(1)	(2)	(3)	(4)
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Moisture	17.3	16.6	14.7	5
Volatile combustible	32.8	33.6	38.4	44.1
Fixed combustible	46.2	47.8	41.6	48.7
Ash	3.7	9	5.3	2.2
Total	100	100	100	100

Most of the samples submitted showed no coking properties, but one sample from Cebu, so far as could be judged from the small quantity at hand, would produce good coke. As is shown by the analyses, many of the coals are high-grade lignites. Many of the samples brought to the laboratory are only surface samples, the original character of which have been changed by weathering. Often, too, samples have adhering rock material, which shows that they have been taken from the edge of the vein.

MISCELLANEOUS.

About a dozen samples of galena of varying purity have been submitted for analysis, and a few iron determinations in iron ores have been made. Two samples of manganese ore showed in one case 55 per cent and in the other 52.9 per cent metallic manganese.

About \$300 worth of gold has been smelted and refined in the laboratory. Some placer gold from Benguet was found to have a fineness of 769.8, and from the same province some quartz gold was found to be very nearly the same.

CLAYS AND LIMESTONES.

The classes examined have been both of the "fat" variety, containing much plastic material, as well as of the "lean" or highly silicious one. Many are white even after exposing to a high oxidizing heat. A few of these have been analyzed.

The limestones examined have been of various kinds—coral, marble, eolitic, etc. It is evident that the two essentials for the production of cement are to be found in great variety and abundance in the Islands.

Analyses of clays and limestones.

CLAYS.

Constituent elements.	(1)	(2)
	<i>Per cent.</i>	<i>Per cent.</i>
Silica	45.24	71.16
Alumina	37.59	16.94
Iron oxide	1	.48
Titanium oxide	.70	.58
Lime	.66	.57
Magnesia	None.	.23
Soda	None.	.46
Potash	1.69	5.64
Water, 125°	1.24	1.56
Loss on ignition	12.67	3.22
Total	100.79	100.84

Analyses of clays and limestones—Continued.

LIMESTONES.

Constituent elements.	(1)	(2)	(3)
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
SiO ₂	38.07	0.88	0.65
Fe ₂ O ₃	9.83	.47	.38
CaO	27.75	54.61	54.62
MgO	.88	.72	.70
CO ₂	22.80	43.62	43.60
Moisture	6.48		.70
Total	99.33	100.30	99.95

WATER SUPPLY OF MANILA.

A systematic examination of the city water supply has been carried on by Mr. Chas. L. Bliss, of the laboratory, during a period covering seven months. These analyses were made nearly every week and were generally of water taken directly from a tap. A few samples were from the Mariquina River at different points between the city and the source. The examination consisted principally of the usual sanitary analysis, but in addition to this a bacteriological examination has also been made by the Biological Laboratory. The data obtained are important in several respects, and will be published in the form of a bulletin.

The maximum and minimum amounts of different substances found during this period are given in the following table. The great divergence in the two values is to be explained by special conditions existing at the time the sample was taken :

Constituent elements.	Mini- mum.	Maxi- mum.
	<i>Per cent.</i>	<i>Per cent.</i>
Total residue	153	220
Fixed residue	127	190
Loss on ignition	16	46
Nitrites (N)		Trace.
Nitrates (N)	Trace.	.36
Free ammonia (N)		.036
Albuminoid ammonia (N)	.031	.100
Oxygen consumed (O)	.65	2.20
Chlorine (Cl)	2.13	4.40
Hardness	58.8	109

WORK OF INVESTIGATION.

This work, which is considered of the highest importance, has been carried on as far as existing conditions would permit. In our present poorly equipped quarters it is very difficult to prosecute such work thoroughly. Of the two employees of the laboratory designed especially for this work, one has been absent from his post during the entire year on account of illness, and the other, to whom the field was entirely new, has been employed during the past five months only. Among the other members of the laboratory staff, who are generally kept busy with routine

work, it has been possible to allow Mr. H. S. Walker considerable time to prosecute the work on cocoanuts which was begun during the previous year.

COCOANUTS.

The ultimate purpose of this investigation will be to give a comprehensive bulletin on the yields of oil which may be expected in the Islands, the nature of the nuts which are best adapted for planting, and the results which may be expected from large quantities of nuts such as are necessary for an adequate basis of supply for factory purposes. In this connection, the first problems studied were the conditions which pertain to the nourishment of the trees and the relation of the soil in which they grow to the oil contents of the nuts produced. As the age of the nuts is a very important factor in the percentage of oil, a study of the change in this percentage by increasing age was also made.

Considerable work was done in devising a method for the rapid and accurate estimation of oil in copra, and the one finally adopted is very satisfactory. The materials used in the investigation were obtained on the Government farm at San Ramon, from which samples of soils systematically collected from various locations were also sent to the Laboratory. It has been observed that cocoanut trees growing near the seashore were larger and more prolific than those farther inland, and it has also been stated that the former yielded better quality of nut. The analyses of the soils gave only slight differences between those near the shore and those farther inland, and an explanation for the variation spoken of must be sought in a different connection and after more extended study. For this purpose samples of cocoanuts were systematically collected at the farm to determine the relations which existed between the quality of the nut and its environment. In order to obtain correct results it was necessary to make analyses on the spot, and this work was done in a small experimental laboratory temporarily fitted up at San Ramon. After all preliminary work on these samples had been completed they were forwarded to the laboratory in Manila for the final determinations. In all about one hundred and fifty specimens have been completed. Experiments have also been made to determine the comparative effect upon the quality of the oil obtained from copra prepared by the two usual processes, sun drying and drying on a grating over a slow fire. Work is now being carried on concerning the effect caused by bacterial growth on copra, both as to the quality and quantity of the oil which can be produced from the product after exposure to the usual micro-organisms. All of these results on this subject are about to be published in the form of a bulletin.

RESINS, ETC.

A systematic study of the resins, gums, and balsams which occur so plentifully in the Islands has again been taken up, and it is hoped and

expected that this work may be completed during the coming year with fruitful results.

GENERAL.

Extensive chemical work in the Tropics being almost a new venture, we are brought face to face with many conditions and problems in carrying on the work which have never heretofore been encountered, and it is to be expected that the laboratory will not reach its maximum efficiency until time and experience have shown the best policy to be pursued in dealing with these new conditions. The many difficulties with which the laboratory has contended in the past have been cited by the Superintendent of Government Laboratories in past reports; they are gradually being eliminated, but some remain still to be considered.

As to the equipment, it is thought that there will be little to be desired, owing to the fact that the Superintendent has given a large portion of his time during the past three years in planning and providing for the new laboratory. However, on account of the large variety of apparatus and chemicals which are used in chemical routine and research work, a large portion of which is perishable, breakable, or expendable, it is necessary to use much study and foresight in order to maintain in advance a perfect supply, such as the various exigencies of chemical work may require. Too much stress can not be laid upon this matter, and to accomplish the end desired it will be necessary to employ exclusively for this purpose a man with a knowledge of chemical apparatus and supplies. The necessity of this work is recognized in all well-equipped laboratories, and the matter is of much greater importance here on account of the great delay experienced in obtaining what is needed.

The need of one or more collectors for the laboratory was pointed out by the Superintendent of Government Laboratories in the last annual report, and it should again be emphasized.

The laboratory has been greatly handicapped in its work for the following causes: First, frequent periods of illness of employees; second, frequent changes, necessitating the taking on of new and inexperienced men; third, long leaves of absence. As an example of what is meant, it may be cited that at present two of the posts in the laboratory are vacant, and it will be impossible to fill them before six months are past. One employee is on extended leave in the United States and one is suffering from illness. If the laboratory would reach its highest degree of efficiency the number of chemists employed in routine work must be sufficiently large to provide for such exigencies, so that an investigator who has begun an important piece of work need not be compelled to periodically leave it in order to clear up routine matter which may need attention, and which could very well be taken by the analytical staff if it were sufficient for the work on hand.



REPORT OF THE SERUM LABORATORY.

The following is the report of Dr. James W. Jobling, Director of the Serum Laboratory for the period from September 1, 1903, to June 15, 1904. Dr. Jobling resigned on June 30, 1904, to be succeeded by Dr. Paul G. Woolley on July 1:

The work done during the period covered by this report has been very varied in character, and owing to the lack of assistance during the first part of the year we were unable to follow it up as completely as it would otherwise have been done. After the arrival of Dr. E. H. Ruediger, who reported for duty on December 12, 1903, the pressure was greatly relieved by his taking charge of the preparation of serums (excepting rinderpest serum) and of the routine microscopical examinations. During the first half of the year a large amount of time was consumed in supervising the inoculation of carabaos which the Government was importing.

Dr. Paul G. Woolley, formerly pathologist in the Biological Laboratory, was appointed assistant director on February 1, 1904, and since then has supervised the preparation of vaccine virus, the general bacteriological work, and at the same time he has been engaged in research work.

The few changes which have been made in the preparation of antirinderpest serum, vaccine virus, plague prophylactic, etc., will be taken up under their respective headings.

The development of Texas fever in nonimmune animals brought from the United States, and which were being made immune to rinderpest by the "simultaneous method," made the immunization of similar animals a matter of difficulty, and necessitated a change in the method. The development of this disease is dwelt upon fully in Bulletin No. 14 of this Bureau. Since this bulletin was issued four more animals have been inoculated for the purpose of rendering them immune against Texas fever, with one death.

A number of changes have been made in the laboratory grounds and buildings since my last annual report. These consist chiefly in additions and improvements to the buildings which were present at that time, and in the filling of some of the holes on the grounds. The latter work was done entirely with the animals belonging to the laboratory. A fly-proof stable was erected for imported high-class cattle which were placed at the laboratory to be immunized against rinderpest.

Great difficulty has been encountered in the breeding and raising of

small animals, such as rabbits, guinea pigs, white rats and mice for laboratory use. During the last two years nearly all of the animals intended for experimental purposes have been imported from China and Japan. In order to have a breeding place belonging to the laboratory, three small buildings formerly used as a hospital for infectious diseases, and which were on ground adjoining the laboratory, were obtained from the Insular Board of Health. The rooms were divided into pens and the small animals placed under the supervision of Inoculator Thos. Bean. These arrangements have only been completed a few months, but during this time the animals formerly on hand have nearly doubled in number and it is believed that no trouble will be experienced in furnishing the laboratories with all of this class of material required.

Until March 1, 1904, the veterinary surgeons and inoculators engaged in the immunization of provincial cattle and carabaos against rinderpest were under the supervision of the Director of the Serum Laboratory, but on the above date the veterinary corps of the Board of Health was organized, and Chief Veterinarian John G. Slee assumed charge. The organization of this department was a great relief to the Director of the Serum Laboratory, as it diminished his executive work and lessened the necessary clerical details of the laboratory.

The provincial rinderpest inoculations were even more successful than during the previous year. To a certain extent this is probably due to the fact that the natives are becoming more accustomed to having their animals inoculated and are discovering that where such inoculating is being done an epidemic is quickly suppressed.

Owing to the opposition of the people the inoculators have seldom been able to treat more than 50 per cent of the animals in any one locality, but recently, because of the good results of the earlier work, the natives have requested inoculators to be sent to their respective towns to immunize the animals which could not be obtained on the first visit. Such requests have been very gratifying to this laboratory, for, recognizing the opposition with which the innovations are generally received by the natives, it shows an increase in their confidence, so that future work in these localities will be complete and thus the necessity of frequent trips owing to the presence of nonimmune animals will be obviated.

Because of the presence of so many infectious diseases of animals in the Archipelago, the preparation of antiserums is a matter requiring the closest attention of the complete isolation of the animals used for this purpose. During the fall of 1903 we lost all of our serum horses from surra, and since then several calves have died from the same cause. In the preparation of antirinderpest serum we were continually on the watch for foot-and-mouth disease, hemorrhagic septicæmia, and surra. In calves, in addition to the diseases just mentioned, a number have recently died of pneumonia, the cause of which is undetermined. This subject is being investigated by Assistant Director Paul G. Woolley.

The greatest demand during the past two years has been for anti-plague and antirinderpest serums. For this reason not much attention has been paid to the preparation of others, although the immunization of two horses for diphtheria antitoxin has been begun, and it is the intention to keep at least one animal for tetanus.

During the first part of May the Director was appointed a member of a committee to make recommendations as to the disposition of 135 Government carabaos, located at Bacolod, Negros, and which were infected with surra. A copy of the committee report is now on file in the office of the Superintendent of Government Laboratories.

ANTIRINDERPEST SERUM.

The statement was made in our last annual report that "the method of using virulent blood which had been drawn into potassium-citrate solution, to prevent coagulation, for the inoculation of serum animals, had not been in use for a sufficient length of time to make a definite statement as to its value." This method has now been tried during the period covered by this report, and we believe, for the reasons given at that time, that it is the best one for the production of antirinderpest serum. Post-mortem examinations are always held on the virulent-blood animals before the blood is used for the inoculation of serum animals. With the exception of holding a post-mortem on the animal bled, this method is also used in the provinces, thus allowing the inoculator, after obtaining blood in one locality, to inoculate the animals in the surrounding barrios by the "simultaneous method." But very few serum animals have shown abscesses following its use. Even when they received very large amounts of the virulent blood the absorption was very rapid, the swellings having entirely disappeared within a few days after inoculation.

Veterinarian Walter Sorrell, attached to this laboratory, has had charge of the preparation of all the rinderpest serum since his arrival on August 18, 1903, and to his intelligent supervision of this work, as well as to his care of the other animals attached to the laboratory, a large portion of credit for the work which has been accomplished is due.

As mentioned in my last report, owing to the difficulty of obtaining nonimmune animals just when they were needed, we were unable to fix the dosage of the serum before its shipment into the provinces. The virulent blood used for inoculating the serum animals was obtained from cattle imported from Shanghai, China. Up to the present time we have been more successful in producing the disease in these animals than in those obtained from any other point.

The cost of preparing the serum is ordinarily very great, but owing to arrangements made with local cattle dealers the virulent-blood animals not contracting the disease and those serum animals which could not be further used for the production of serum were traded for new ones, and thus a considerable reduction in the cost of the product was realized.

TABLE NO. 1.—*Number of cattle purchased, exchanged, and sold during the period covered by this report.*

Month.	Pur- chased.	Ex- changed.	Sold.
1903.			
September	32	6	
October	9	11	19
November	30		
December	20	13	
1904.			
January	12		
February	22		1
March		20	
April	10	8	
May	11	20	
June 15	10		
Total	156	78	20

The approximate saving to the Government by means of these exchanges amounts to about ₱5,040.

TABLE NO. 2.—*Amount of antirinderpest serum prepared and distributed.*

Month.	Prepared.	Issued.	Returned.	Sold.
1903.				
September	123,750	3,450		
October	60,000	164,450		
November	146,400	210,300		
December	98,400	171,300	40,000	
1904.				
January	111,900	123,300	6,000	
February	133,200	22,600		18,000
March	54,600	39,600	4,800	24,000
April	123,990	90,000		
May		103,300		
June 15	128,400	146,500		
Total	980,640	1,164,800	50,800	42,000

There were on hand September 1, 1903, 177,450 cubic centimeters of serum, and 27,100 cubic centimeters were taken up later.

TABLE NO. 3.—*Number of animals inoculated in the laboratory, with the amount of serum and blood used.*

Month.	Inoculated with—		Amount.	
	Serum.	Blood.	Serum.	Blood.
1903.				
September	26	118	1,760	69,412
October	42	64	2,100	31,443
November	78	96	6,150	43,309
December	68	153	6,800	55,536
1904.				
January	65	107	6,400	51,670
February	47	114	4,080	34,310
March	28	126	1,550	52,965
April	17	97	1,700	66,388
May	21	64	4,150	56,782
June 15	20	17	1,950	14,554
Total	412	966	36,640	476,369

The "simultaneous method" was used but very seldom in the immunization of cattle and calves belonging to the laboratory, for, as stated in my last annual report, so many were infected at the time of admission that the mortality was very high when this method was employed. As a consequence the course adopted was to inoculate the animals with 50 to 100 cubic centimeters of serum and a few days later with 1 to 10 cubic centimeters of virulent blood.

A large number of blood smears were examined for the presence of the surra parasite. The results are noted in the table given below:

TABLE NO. 4.—*Surra examination.*

Month.	Number ex- amined.	Positive.
1903.		
November.....	1	1
December.....	215	32
1904.		
January.....	309	19
February.....	527	74
March.....	152	14
April.....	5	1
May.....		
June 15.....	5	2
Total.....	1,214	131

RINDERPEST SERUM—PROVINCIAL INOCULATIONS.

Rinderpest having been reported to be present in the Province of Ilocos Sur, Veterinarian Thomas Owen was directed to proceed to that province for the purpose of inoculating all the remaining animals against the disease.

Dr. Owen was able to find only three sick animals and was unable to obtain blood from any one of them. For this reason he used serum alone in doses of 50 cubic centimeters each.

TABLE NO. 5.—*Number of animals inoculated in each locality.*

Locality.	Number.	Locality.	Number.
Vigan.....	50	Ran Cohlina.....	52
Casayan.....	113	Lape.....	55
Santa.....	24	Narvacan.....	237
San Domingo.....	39		
Magsingal.....	54	Total.....	624

No cases of the disease have been reported in this province since Dr. Owen returned, so that it is presumed that the epidemic was stopped in its infancy.

Chief Sanitary Inspector Lewis Barron, detailed by the Board of Health for duty in the Provinces of Bontoc and Benguet, inoculated 307 animals during January and 425 during the month of February, 1904. Mr. Barron has never been trained in the method of bleeding a sick

animal, so he was unable to use the "simultaneous method." He has been kept supplied with antirinderpest serum, and when he was notified that the disease had appeared at any point in the province in which he was working he inoculated all the animals in that locality with 50 cubic centimeters of serum. By following this method the disease has not been able to gain any headway, in each instance being stamped out at once.

Rinderpest having been reported in the Province of Ambos Camarines, Chief Inoculator Albert M. Newby, accompanied by two Board of Health inoculators, was ordered to proceed to that point for the purpose of inoculating the remaining animals.

TABLE No. 6.—*Number of animals inoculated and the results obtained.*

Locality.	Simultaneous.		Serum.		Total.
	Inoculations.	Deaths.	Inoculations.	Deaths.	
Magarao	146	3	44	3	190
Calabanga			215		215
Total	146	3	259	3	405

Mortality: Simultaneous, 2.05 per cent; serum, 1.14 per cent.

A communication having been received during the first part of October stating that rinderpest was present in the Province of Cagayan, Veterinarian A. R. Glaisyer, accompanied by three inoculators, was ordered to proceed to that province for the purpose of immunizing the remaining animals. The party left October 20, 1903.

TABLE No. 7.—*Method of inoculation used, the number inoculated in each locality, and the results obtained up to March 1, 1904.*

Barrio.	Simultaneous.		Serum.		Total.	
	Inoculations.	Deaths.	Inoculations.	Deaths.	Inoculations.	Deaths.
Minanga, Piat	49		3		52	
Apayao, Piat	97	1	8		105	1
Aquit, Piat	88		5		93	
Maggiling, Piat	92		3		95	
Macapit	18		2		20	
Enrile	324	7	16		340	7
Piat	79		73		152	
Gatasavan	57		36		93	
Bisisug	11				11	
Maggiling	116		4		120	
San Isidro	85				85	
Tuao	89		6		95	
Total	1,105	8	156		1,261	8

Mortality, 0.6 per cent.

The results of the inoculations after March 1 are included under the heading of Cagayan in Table No. 8. In each locality where the inoculations were done rinderpest was quickly suppressed, only those animals which were in the incubation stage at the time of inoculation afterwards developing disease.

Table No. 8 gives a summary of all provincial inoculations from September 1, 1903, to June 15, 1904.

TABLE No. 8.—*Summary of all provincial inoculations from September 1, 1903, to June 15, 1904.*

Province.	Simultaneous.		Serum.		Total.	
	Inocula- tions.	Deaths.	Inocula- tions.	Deaths.	Inocula- tions.	Deaths.
Ilocos Sur			644		644	
Lepanto			732		732	
Ambos Camarines	146	3	259	3	405	6
Cagayan	2,257	74	17		2,274	74
Bulacan	364	29	48		412	29
Capiz			20	1	20	1
Iloilo	289	21	361	1	650	22
Cebu	122	3	138		260	3
Union			2,244		2,240	
Total	3,177	130	4,464	5	7,641	135

Mortality: Simultaneous, 4.09 per cent; serum, 0.11 per cent; total, 1.76 per cent.

A large number of animals have been inoculated during the last two months, but as complete reports have not been received from the veterinarians in charge the results can not be fully noted in the foregoing table (No. 8).

VACCINE VIRUS.

But few changes were made in the preparation of vaccine virus as it was described in my last annual report. The chief one consists in the use of carabao calves in the preparation of the seed virus. The method of immunizing the calves against rinderpest has been given above.

During the period beginning September 14, 1903, and ending February 1, 1904, Mr. Chas. B. Hare, of the Biological Laboratory, by arrangement with the Director of that laboratory, was in charge of the preparation of the virus. Mr. Hare has had considerable experience in this line of work, and during the time he was in charge was by constant attention able to improve both the quality and quantity of the virus previously obtained.

Since February 1, 1904, Mr. W. D. Cheek has taken up this work under the supervision of Assistant Director Paul G. Woolley.

From the experience obtained during the past two years, we have become convinced that the best animal to use in the preparation of vaccine virus, at least in this portion of the Orient, is the carabao calf, but because the majority of the local carabaos have died from rinderpest we have been unable to obtain a sufficient number of the calves for our purposes. For this reason we have been using this class of animal for preparation of the "seed" virus only, and ordinary calves for the production of that used commercially. By using "seed" virus which has not been passed through more than two calves we have been able to supply the Board of Health with all the material called for, and we believe the

quality is equal to that of any virus to be obtained elsewhere in the world.

Reports received from the Marine-Hospital Service and from members of the Board of Health show a record of most favorable results. Last year we experienced much difficulty in preparing vaccine virus during the hot months, so that this season we manufactured a large amount during the cooler season, keeping it in stock and avoiding the vaccination of animals during hot weather.

TABLE NO. 9.—*Number of calves bought, obtained by transfer, vaccinated, and the number from which virus was collected during the period covered by this report.*

Month.	Pur- chased.	Obtained by transfer.	Vacci- nated.	Number from which virus collected.	Number sold.
1903.					
September	14		17	14	22
October	9		18	12	
November	14		26	20	
December	44		27	33	
1904.					
January	58		39	30	
February	26		27	25	14
March	15		26	23	30
April			9	9	
May	1	26	8	5	
June 15	6				
Total	187	26	197	171	66

The discrepancy in many instances is due to the fact that a number of grown animals were vaccinated for experimental purposes, with some failures, and some of the calves developed either foot-and-mouth disease or rinderpest.

The approximate saving to the Government on exchange of calves amounts to about ₦1,820, and by sale ₦2,112, or a total of ₦3,932.

TABLE NO. 10.—*Amount of virus prepared, the amount issued to the Board of Health, and the amount used in the laboratory.*

Month.	Prepared.	Issued.	Surplus seed for distribu- tion.
1903.			
September	136,200	75,550	
October	53,100	56,793	
November	37,360	60,700	
December	90,000	122,900	
1904.			
January	701,000	170,180	
February	366,180	211,200	
March	537,000	225,210	182,000
April	110,000	231,050	
May	85,000	176,950	
June 15		130,900	
Total	2,115,840	1,461,433	182,000

On hand September 1, 1903, 3,543 doses.

PLAGUE PROPHYLACTIC.

During the first part of the year plague prophylactic was prepared chiefly after the method of Shiga, but recently this has been discontinued and that of Haffkine used instead.

TABLE No. 11.—*Amount of Shiga's and Haffkine's prepared and the amount issued to the Board of Health.*

Month.	Shiga's.		Haffkine's.	
	Prepared.	Issued.	Prepared.	Issued.
1903.				
September		2,000		
November	7,242	8,120	2,346	
December	1,800	5,480		465
1904.				
January		2,806		
May			7,805	245
Total	9,042	18,406	10,151	710

On hand September 1, 1903, 9,364.

ANTIPLAGUE SERUM.

The death from surra of all our serum horses has prevented the production of this serum during the last year, but we now have on hand six animals which are as rapidly as possible being brought up to the bleeding point.

These horses are now being kept in a fly-proof stable, and it is hoped from now on we will be able to supply the entire local demand for this product.

This work is being done under the supervision of Dr. E. H. Ruediger.

MALLEIN.

The production of mallein was started during the last year, and from the reports received its use as a diagnostic agent has been attended by the greatest success.

During the period covered by this report, 1,050 doses were prepared and 307 issued.

SURRA IN IMPORTED ANIMALS.

A detailed report was made on this subject to the honorable the Civil Governor, Wm. H. Taft, before his departure. This report was complete up to and including November 30, 1903, since which time the animals have been so scattered that our records are very incomplete and no attempt will be made to give figures. For this reason the subject will be dwelt on only in a general way.

As stated in the report, Dr. Paul G. Woolley, at that time pathologist in the Biological Laboratory, was the first to find a large number of the animals imported for the Government to be infected with the surra parasite. This discovery was made on October 22, 1903, and up to

November 30, 1903, 214 infected animals were killed by the Board of Health. One hundred and ten of these belonged to the lot of animals which were permanently immunized in Shanghai; the remainder were among these received after September 5, 1903, and which had been temporarily immunized in Shanghai.

Examination of a portion of the animals sold before the discovery that surra was present in these herds, and also of some of those subsequently disposed of, and which after repeated microscopical examinations have been called negative, show that a large percentage now harbor the parasite. A number of these animals were killed by the Board of Health.

When an infected animal is isolated and given the proper food and attention, as is the case when it is in the hands of the native owner, it is yet an unsettled question as to how long it will live. Recently a microscopical examination of the blood of nearly all the carabaos in the city of Manila proved a small percentage to harbor trypanosoma. Nearly all of the infected animals were in excellent condition, but as the length of time during which the parasite has been in their blood is not known it is uncertain what effect it will have on their health.

Where the infected animals are herded they appear to succumb to the disease within a short period of time. It has been noticed that even healthy carabaos are apt to become diseased when herded together in large numbers, and such being the case it is not remarkable that animals suffering from surra should die much more rapidly when kept under the same conditions.

For the above reasons it is believed that if infected animals are isolated and given the proper food, attention, and work they will live for at least a number of months and a certain percentage even may show a permanent recovery. It must be understood that in making these remarks I am only referring to the course of the disease, but if healthy, uninfected animals are present in the vicinity the wisest course would be to kill the infected animal as soon as the parasite is found.

The Director was one of a committee appointed by the honorable the Civil Governor to examine and make recommendations for the disposition of 135 infected carabaos located at Bacolod, Occidental Negros. Nearly all of these animals had harbored the parasite for four to five months. Forty-one animals not mentioned in the instructions received from the honorable the Civil Governor, which had been sold four months before the time of my visit and which were found to be infected a few days after sale, were also examined. The excellent condition of the majority of the animals was a surprise to the committee, especially the appearance of those which had been working daily for the last four months. This was the case to so marked a degree that the owners would not believe that anything was wrong with the animals. By microscopical examination we were only able to find the parasites in about 25 per cent, but it is probable that animal inoculations would have shown a larger number to be infected.

SPECIAL REPORT OF THE SERUM LABORATORY.

The special report for the Serum Laboratory for the period from June 15 to September 1, 1904, by Dr. Paul G. Woolley, Director of the Serum Laboratory, is as follows:

The annual report for the Serum Laboratory is covered by the special report of Dr. James W. Jobling for that part of the year extending from September 1, 1903, to June 15, 1904, and by the following special report of the present Director describing the work from June 15 to September 1, 1904.

The only change in the staff of the laboratory was caused by the resignation of Dr. Jobling on July 1 and the appointment of the present Director to fill the vacancy caused thereby. Dr. Jobling's service was marked by a conscientious efficiency which will entail a strenuous emulation if the standards set by him are upheld.

There is a large amount of material available for bacteriologic and pathologic work at the Serum Laboratory, but at present the time of the Director and of the assistant bacteriologist is so occupied with the ordinary routine that little opportunity is afforded to engage in researches. In spite of these conditions, Dr. Ruediger, assistant bacteriologist, is carrying out some most interesting and valuable experiments in connection with the preparing of plague, typhoid, and diphtheria antitoxins. With the assistance of another bacteriologist careful records might be kept of post-mortem findings in all animals dying at the laboratory, and eventually interesting and useful data could be obtained. In the past and at the present time this is impossible.

Since the departure of Dr. Jobling the study of one problem has been completed—that is, that of broncho-pneumonia, occurring chiefly in vaccine calves. This work was carried on by the Director and Dr. Walter Sorrell, veterinarian, and it was shown that with many of the cases *B. bovisepiticus* was associated.

Brief report on several cases of yaws, one on a case of pinto or paño blanco, and one on *B. violaceus manila*, a pathogenic chromogenic bacillus, have been prepared by the Director.

An illustrated brochure giving in detail the methods in use in the preparation of vaccine virus at the Serum Laboratory will also be issued in the near future, so as to inform the general public in regard to the care and technique which this laboratory uses in preparing this material.

At the present time two peculiar skin diseases of cattle are being studied—one the common ringworm so prevalent in the Islands, the other an affection which grossly resembles actinomycosis but which is due to an entirely different cause.

Texas fever in its typical form has not been encountered since the report which was issued earlier in the year, but several animals have died of a recrudescence of this disease which followed attacks of rinderpest and occurred during the convalescence of the animals from that disease. Lingård had a similar experience in India and Koch in South Africa.¹ The reason for the flaring up of the Texas fever under these conditions is found in a diminution of resistance which is caused by the infection with rinderpest. This gives opportunity for the renewed activity of a latent infection with pyroplasmas. An analogy to this condition may be seen in cases of malaria in human beings. The fact that such cases of Texas fever have occurred in Shanghai and the further one that pyroplasmas have been found in Hongkong (private communication from Dr. Jobling) would seem to corroborate the conclusions given in the report on Texas fever issued from this laboratory and render more certain the fact that Texas fever must be endemic in China.²

In the report of Dr. Jobling reference was made to a herd of carabaos many of which contracted surra and were landed for sale on the Island of Negros previous to their infection. On July 9, 1904, the last of these animals imported from Shanghai by the Government were sold at public auction. From the very careful records which have been kept by Inoculator Otto Schmidt, for the use of which we are indebted to Dr. Slee, chief veterinarian, some very interesting facts are established. One of these is that carabaos do not prosper when herded together. This is a confirmation of Dr. Keylock's experience in Shanghai. Our experience with carabaos shows that they are very susceptible to infectious diseases if they are kept confined in large numbers, but that when given plenty of room for grazing and bathing, and plenty of work, they do well. The other important fact is that the carabao is much more resistant to surra than might have been supposed judging from our early experience at Pasay, where so many of the animals died. It is probable that these deaths were indirectly due to close herding and directly to surra. In Negros some animals were killed after they were found to be harboring trypanosoma, but after a short experience it was found that the infection is a source of but little danger to animals which are well cared for and worked. This was so evident that in the above-mentioned island there was no difficulty even in selling infected animals. Furthermore none of the ones which were sold have to the present time been reported to be otherwise than in a perfectly satisfactory condition. This last fact is interesting simply in a scientific way, because the danger of spreading

¹ Am. Rept. Imp. Bacteriologist for 1902-3, Calcutta. 1903.

² Bulletin No. 14, Bureau of Government Laboratories.

the infection from animals which are apparently well is no less than it would be in the cases of those in which the course of the disease is fatal. An animal which constantly may be a source of infection can have no place in any community other than one which is not only overrun with the disease but which is completely isolated from noninfected territory. Such were the conditions in Negros. Furthermore the infected animals in that island were sold by popular consent.

The breeding of small animals (rabbits, guinea pigs, rats, and mice) has so prospered that although the death rate is still high the birthrate is higher. To the previous collection of small animals, chickens and pigeons have been added with every hope that they will increase and supply the laboratories with abundant experimental material.

ANTIRINDERPEST SERUM.

TABLE NO. 1.—*Number of cattle purchased, exchanged, sold, and died within the period covered by this report.*

Month.	Pur- chased.	Ex- changed.	Sold.	Died.
June 15-30 -----	16	7	4	1
July -----	20	11	-----	12
August -----	5	30	-----	9
Total -----	41	48	4	22

Value of sales and exchanges, ₱3,380.

During May and June the number of serum animals was diminished by natural causes, and at the same time it was very difficult to obtain new ones. The result was that in July and August the available supply of serum was low and all orders could not be filled immediately. Since June 15, however, a sufficient number of cattle and a sufficient quantity of serum are being produced to satisfy all demands which may be made after the 1st of October. Practically all the work involved in the preparation of this serum is under the supervision of Dr. Walter Sorrell, to whom great credit is due.

TABLE NO. 2.—*Antirinderpest serum prepared and distributed.*

Month.	Prepared.	Issued.	Returned.
June 15-30 -----	24, 400	71, 310	-----
July -----	143, 550	235, 700	117, 690
August -----	170, 700	160, 150	30, 000
Total -----	343, 650	467, 160	147, 690

Amount on hand September 1, 1904, 33,065 doses.

Experiments in preparing a desiccated serum are in progress at the present time.

TABLE NO. 3.—*Animals inoculated at the Serum Laboratory and amounts of virulent blood and serum used.*

Month.	Inoculated with blood.	Amount of blood. ¹	Inoculated with serum.	Amount of serum. ¹
June 15-30.....	19	14, 115	11	1, 100
July.....	112	60, 421	94	35, 905
August.....	94	41, 360	124	11, 650
Total.....	225	115, 896	229	48, 655

¹ Cubic centimeters.

For the reasons given by Dr. Jobling in his special report no “simultaneous” inoculations have been used, the method being that described by him.

At times there have been virulent blood cattle on hand more than was necessary for the purpose for which they were intended, and it was thought advisable to attempt to save these animals for serum purposes. Accordingly Dr. Sorrell instituted the method of using large amounts of serum intravenously. By carrying out this procedure, using from 150 to 500 cubic centimeters of serum, the majority of the animals have been saved, where they have been taken in the early stages of the disease. The curative properties of the serum, as well as its prophylactic qualities, may therefore be considered as proven.

TABLE NO. 4.—*Number of animals inoculated, amount of serum used, and results of inoculations.*

Number of animals.	Amount of serum used. ¹	Number cured.	Number died.
3	150	3	—
6	200	4	2
5	300	5	—
2	500	1	1
16	—	13	3

¹ Cubic centimeters each.

NOTE.—All these animals which are reported dead succumbed to Texas fever during convalescence.

TABLE NO. 5.—*Number of examinations of smears of blood for surra.*

Month.	Number examined	Number positive.
June 15-30.....	1	1
August.....	8	4
Total.....	9	5

SURRA IN CARABAOS.

TABLE No. 6.—*Number of animals in the Negros herd of Government carabaos.*

Herd.	Number.	Died.	Mortality.
D.....	192	53	<i>Per cent.</i> 27.6
Negros.....	50	19	38
Manila.....	149	70	46.9
Total.....	391	142	36.57

TABLE No. 7.—*Cause of death.*

Cause.	Herd D.	Negros.	Manila.	Total.
Malignant catarrh.....	35			35
Exhaustion or debility.....	3	2	2	7
Surra (died or killed).....	14	18	58	90
Pneumonia.....			1	1
Septicæmia.....	1			1
Accidents.....			8	8
Total.....	53	20	68	142

TABLE No. 8.—*Number of animals sold, returned after sale, and died after return.*

Sold.....	250
Returned because of surra.....	5
Died after return.....	1
Of the five animals returned, three were resold.	

TABLE No. 9.—*Number of animals in each herd whose blood contained trypanosoma before sale and after sale, and the number of deaths after sale.*

Herd.	Positive before sale.	Positive after sale.	Deaths after sale.
D.....	22	40	9
Negros.....	¹ 47		
Manila.....	² 121		3
Total.....	190	40	12

¹ 94 per cent.² 81.2 per cent.TABLE No. 10.—*Day after landing upon which parasites were found in the blood of each animal.*

Day.	Herd D.	Negros.	Manila.	Number.	Day.	Herd D.	Negros.	Manila.	Number.
3.....			22	22	40.....	1	3		4
5.....			2	2	41.....		7		7
11.....			30	30	42.....	2			2
16.....	1		30	31	43.....	3			3
17.....			18	18	44.....	4	1		5
18.....			1	1	46.....		1		1
20.....			3	3	48.....	2			2
21.....			2	2	50.....	1	2		3
22.....	2		3	5	52.....	3	1		4
23.....			3	3	53.....	1			1
26.....			5	5	54.....	3			3
27.....	1		1	1	55.....	6			6
28.....	5			5	56.....	1			1
29.....			1	1	59.....	13			13
30.....	1			1	63.....	1			1
32.....	3		1	4	65.....	8			8
35.....		17		17					
39.....		15		15	Total.....				231

VACCINE VIRUS.

Since June 15, 1904, Mr. W. D. Cheek has had charge of this work under the supervision of the Director. All the bacteriologic examinations have been made by the latter. This year enough vaccine has been prepared to supply all needs during the hot season, so that few animals were used during that time. The close of the unusually warm weather has been so irregular both as to temperature and moisture that inconstant yields have been collected from vaccinated calves. This state of affairs has been experienced in past years and was to be expected.

During July some unfavorable reports were received regarding the vaccine, and in certain cases the bad results were traceable to a stock of vaccine that had been treated with an antiseptic. In other cases the results were undoubtedly due to a lack of proper facilities for preserving the virus after it had left the laboratory.

The laboratory records show 22 per cent of takes in secondary cases, and also show that one stock of virus after eight months in the ice box was active.

TABLE NO. 11.—*Number of calves purchased, obtained by transfer, number vaccinated, number from which virus was collected, and number sold.*

Month.	Pur- chased.	Ex- changed.	Vacci- nated.	Number from which virus was collected.	Number sold.
June 15-30			5	5	
July	9	16	16	13	25
August	14	¹ 20	29	35	5
Total	23	36	60	53	30

¹ 28 delivered in exchange; total, 48; value of exchange, ₧1,138. Several adult serum animals are also included in this table.

TABLE NO. 12.—*Amount of vaccine virus prepared and issued.*

Month.	Prepared.	Issued.
June 15-30	50,000	73,800
July	186,500	246,900
August	353,000	267,850
Total	589,500	588,550

On hand September 1, 1904, 656,740 doses.

PLAGUE PROPHYLACTIC.

The manufacture of plague prophylactic has been in the complete charge of Dr. E. H. Ruediger since June 15, 1904, and he is engaged in the preparation of the materials, using the methods of Shiga, Haffkine, and Lustig.

TABLE NO. 13.—*Plague prophylactic, Haffkine method.*

	Cubic centimeters.
July	3,000
August	3,900
Total	6,900
On hand September 1, 1904	8,536

PLAGUE SERUM.

Under the supervision of Dr. Ruediger, several horses are being prepared for the production of antiplague serum.

MALLEIN.

No mallein has been prepared in the period covered by this report, enough remaining on hand. All of this material is thoroughly tested before it is distributed upon healthy and glandered horses furnished by the chief veterinarian of the Board of Health.

OTHER PRODUCTS.

Arrangements are now being made in order to supply tetanus antitoxin and rabies virus. Dr. Kitasato, of Tokio, has had the kindness to furnish materials for this work.

EXHIBITS.

- I. A temperature chart of an animal dying of Texas fever in its convalescence from rinderpest. Shows the effect of the use of serum given intravenously in large doses even when the disease is found in the third and fourth day.
- II, III. Charts showing the effects of intravenous injection of serum in uncomplicated cases of severe rinderpest.
- IV, V. Charts showing the effects of small subcutaneous doses of serum in uncomplicated rinderpest.



REPORT OF BOTANIST.

The following is the report of Mr. Elmer D. Merrill, botanist, covering the botanical work of the Bureau from September 1, 1903, to August 31, 1904:

Botanical investigations, under the auspices of the Insular Government, were first instituted in the Bureau of Agriculture at the time of its organization in April, 1902. The position of botanist was solely within that Bureau until July, 1902, when it was extended so as to cover the needs both of the Bureaus of Agriculture and Forestry. This unsatisfactory arrangement continued until July, 1903, when the botanist and the botanical equipment were transferred to the Bureau of Government Laboratories, and by this action laboratory work in this branch of science was placed on the same plane as that of the others, and, following out the plan of organization of this Bureau, all Departments of the Government are now at liberty to request the assistance of the laboratories in this line of work. Later in the year another systematic botanist, Dr. E. B. Copeland, and two botanical collectors, Mr. A. D. E. Elmer and Dr. H. N. Whitford, were appointed, so that the botanical staff now includes four men.

There has been no radical change in the general character of the botanical work, the greatest amount of attention during the past year having been given to increasing the herbarium in order to enhance its value as a reference collection, and, in Manila, the endeavor has been to identify the material as far as possible, because of the relationship which other lines of botanical research bear to systematic botany. As the work develops other branches will be given prominence, Dr. Copeland who is now a member of the force, being especially fitted to undertake work on vegetable physiology, although up to the present he has devoted himself to the study and classification of the vascular and cellular cryptogams of the Philippine flora. Dr. Whitford is prepared to undertake work on ecology as soon as he obtains a working knowledge of the characteristic species of the Philippine flora, while Mr. Elmer is well fitted for herbarium work, so that, at intervals, when he is in from collecting trips, his services can be utilized to advantage.

HERBARIUM.

At the time of the transfer to the Bureau of Government Laboratories in July, 1903, the herbarium contained 5,061 mounted specimens, while at the present date it has 10,989 specimens, 5,928 mounted sheets

having been added during the past year. Much material collected during that time is not included in the present report, as the opportunity to prepare it for the herbarium has been lacking. Of the 10,989 mounted sheets in the herbarium, 8,928 are of Philippine material, and 2,061 are of foreign origin, they having been received in exchange from various institutions, chiefly situated in the Malayan and southern Asiatic regions.

The 5,928 specimens added to the herbarium in the past year have been received from the following sources:

FOREIGN.

Received from the 's Lands Plantentuin, Buitenzorg, Java, duplicates of plants cultivated in the Botanical Garden	126
From J. C. Willis, director of the Royal Botanical Garden, Perideniya, Ceylon, duplicates of Ceylon plants	62
From the United States Department of Agriculture, Washington, D. C., duplicates of grasses from the southern United States	30
	218

PHILIPPINE.

Collection of Elmer D. Merrill, Provinces of Bataan, Pampanga, Rizal, Tarlac, Tayabas, and Camarines Sur, Luzon, and from the Islands of Mindoro and Masbate	989
Collection of Dr. E. B. Copeland, Province of Bataan, Luzon, Districts of Davao, Cotabato, and Zamboanga, Mindanao, and from the Islands of Calignan, Bayas, Panay, and Negros	1,360
Collection of A. D. E. Elmer, Provinces of Union and Benguet, Luzon	1,120
Collection of H. N. Whitford, Province of Bataan, Luzon	537
Received from the Forestry Bureau, collected by—	
J. W. Ritchie, Guimaras Island	24
W. H. Ware, Province of Tayabas, Luzon	25
P. T. Barnes, Province of Bataan, Luzon	306
J. A. Gammill, Guimaras Island	140
W. Klemme, Province of Tayabas, Luzon	26
G. S. Van Wickle, Province of Camarines Sur, Luzon	21
C. H. Bath, Province of Tayabas, Luzon	3
W. M. Maule, Province of Zambales, Luzon	30
T. E. Borden, Province of Bataan, Luzon	219
E. Hagger, Province of Tayabas, Luzon	10
Mariano Ramos, Province of Rizal, Luzon	96
	900
Received from the Philippine Exposition Board, one set of duplicate material of the following collections:	
H. Hallier, Provinces of Laguna and Zambales, Luzon, Zamboanga, Mindanao, and Island of Basilan	773
DeVore and Hoover, Island of Basilan and District of Davao, Mindanao	382
Leon Guerrero, Province of Rizal, Luzon	42
Miscellaneous material	45
	1,242
Miscellaneous unnumbered material of various collectors	36
Collection of J. V. Barrow, Cebu, for identification	32
Collection of Luther Parker, Bacolor, Pampanga, for identification	79
Total	6,513

IDENTIFICATION OF BOTANICAL MATERIAL.

During the past year a large percentage of the material which has been received has been identified in this office, for as yet but little aid has been received from outside sources. As the herbarium increases the library is made more complete, the employees of this office acquire a more intimate knowledge of the Philippine flora, and a very much larger percentage of identifications can be made here. Dr. V. F. Brotherus, of Helsingfors, Finland, has favored us with the identification of twenty-five species of Philippine *Musci*, from my own collection, but no other direct identifications have been received, although much material has been dispatched to various specialists and institutions. During the previous fiscal year 2,302 specimens of Philippine plants were sent to the Botanical Garden, Berlin, Germany, as at that time Dr. J. Perkins was employed by the Carnegie Institution for botanical investigations on the Philippine flora at Berlin, and accordingly it was expected that at least a partial list of the identification of this material would be furnished at an early date, but so far the only ones received from this source have consisted of about 300 numbers cited by Dr. Perkins and her collaborators in the first fascicle of her "Fragmenta Floræ Philippinæ," published in February, 1904. It is to be presumed that many more specimens of the collections have been identified, and that the results will be noted in future fascicles of this work.

In addition to the work of this office, a considerable amount has been done for other Bureaus and persons. Approximately 890 specimens have been identified for the Forestry Bureau, 103 for the Bureau of Agriculture, 265 for Dr. J. G. Coulter (teacher of botany in the Philippine Normal School), and about 150 identifications for various persons who have submitted material. In many cases it is quite impossible to identify specimens in Manila and this is especially true in the case of critical families and genera, while in other cases we have not the literature available for the study of certain groups, and hence it will for some time to come be necessary to send much duplicate material to various specialists in Europe and America. Arrangements already have been entered into with several such investigators in various groups looking to the identification of our Philippine material, and already much has been sent away.

EXCHANGE AND DISTRIBUTION OF DUPLICATE BOTANICAL MATERIAL.

The collection of duplicate material in the office is at the present time a very extensive and valuable one, and it serves several purposes. One is that material collected in duplicate gives us a very full series of specimens of the same plant for study, and hence some idea of the variation in any given species; another, that such a collection affords us sufficient material to enable us to send a considerable quantity to

specialists in America and Europe for identification in critical families and genera, or, when it becomes necessary, for comparison with types in European herbaria. Again, the collection gives us much valuable material which can be offered in exchange to various botanical institutions in the Tropics of the East. All collectors receive instruction to secure in abundance material representing each species, when the circumstances admit of its preparation and preservation. The first set is deposited in the herbarium of the Bureau, the remainder is poisoned with corrosive sublimate and preserved in a separate collection until desired for distribution or exchange.

The following duplicate material has been distributed during the past year:

The United States National Herbarium, Washington, D. C.....	2, 155
The New York Botanical Garden, Bronx Park, New York.....	1, 055
The Royal Botanic Garden, Calcutta, India.....	607
The Gray Herbarium, Cambridge, Mass.....	875
Philippine Exposition Board, St. Louis Purchase Exposition, St. Louis, Mo.....	515
The Missouri Botanical Garden, St. Louis, Mo.....	355
Botanisches Museum und Laboratorium für Waarenkunde, Hamburg, Germany.....	456
Total.....	6, 018

With the exception of 1,055 specimens sent to the New York Botanical Garden and 1,017 sent to the United States National Herbarium, which were duplicates of plants received during the past year from the 's Lands Plantentuin, Java, all the other material was from my personal collection. In addition to the specimens enumerated above, twenty-five specimens of Philippine mosses were sent to Dr. V. F. Brotherus, Helzingfors, Finland, and all the mounted material and duplicates of seventy numbers of the *Orchidaceæ* were sent to the Ames Botanical Laboratory, North Easton, Mass., for identification, while at the request of Dr. C. S. Sargent, director of the Arnold Arboretum, Jamaica Plain, Mass., all the material of the genus *Pinus* (20 sheets) was loaned to that institution to aid Dr. Sargent in his special studies.

In order to prevent future confusion in the work on Philippine systematic botany, the policy of distributing only identified duplicates has been adopted, except in those cases where it has become necessary to send specimens abroad for identification, and then, so far as possible, all the available duplicates are supplied. The following plan has been found satisfactory both to this office and to those to whom material has been sent: All the available material, including the specimens mounted for this herbarium as well as all duplicates and notes, are supplied, in order that the investigator may have a full series with which to work, and when the identifications are completed one duplicate is retained by the specialist for his own collection while the remainder is returned to this office for distribution.

BOTANICAL MATERIAL FROM OUTSIDE SOURCES.

Little botanical material has been received during the past year from outside sources, but arrangements for exchange have been made with the following institutions and persons:

The Royal Botanic Garden, Calcutta, India, for plants of tropical Asia and the Malayan region.

The 's Lands Plantentuin, Buitenzorg, Java, Javanese plants.

Botanic Garden, Sydney, New South Wales, Australian plants.

C. A. Barber, Government botanist, Madras, British India, Indian plants.

The Hamburg Museum, for duplicates of the collection of Dr. H. Hallier, from the Philippines, Marianne Islands, Singapore, etc.

A. Usteri, Zurich, Switzerland, Philippine plants.

The Field Columbian Museum, plants of tropical America.

The newly established Agronomic Station in Cuba, Cuban plants.

The New York Botanical Garden, Philippine plants collected by Mr. R. S. Williams.

Correspondence has been opened with other institutions in order to secure more exchanges of botanical material, and, doubtless satisfactory arrangements will be entered into.

While I was still botanist in the Bureau of Forestry I submitted a plan to the chief of that Bureau, giving the details of a proposed distribution of duplicate botanical material to the several forestry schools of the United States, and this plan has been in operation since my transfer to the Bureau of Government Laboratories, material being drawn from the collections made by the employees of this and of the Forestry Bureau. The material is distributed under the title of "Decades of Philippine Forest Flora," each specimen being provided with a printed label giving the scientific and native names, the general distribution, the value and uses of the several species, and other data of importance. The first ten decades at the present time are about ready for distribution, about ten full sets of each species being prepared, and a continuation of the work is contemplated. It is believed that this material will aid students of forestry in the various schools of the United States, and will especially be advantageous to those who plan to enter the Philippine forestry service, the material supplied being such as will give students an opportunity of becoming acquainted with the botanical characters of the most important Philippine timber trees.

WORK FOR THE PHILIPPINE EXPOSITION BOARD.

Work undertaken for the Philippine Exposition Board during the preceding year was continued, and it called for more or less of my time and attention up to April, 1904, when the last of the botanical material destined for the St. Louis Purchase Exposition was forwarded to the Philippine Exposition Board at St. Louis. The work included the examination and identification of several thousand specimens of woods,

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fibers, medicinal plants, fruits, seeds, and botanical specimens, the latter being mounted and prepared for exhibit in this office. A chapter on Philippine botany was prepared for the official catalogue of the Philippine exhibit, and an appendix, giving a list of the Philippine timber trees with native and scientific names, with the uses of the wood so far as known, was added. Additions, changes, and corrections in the same publication were made by the botanist in the chapters on forestry and agriculture.

The collection from the Island of Basilan, and from Davao, Mindanao, of Messrs. DeVore and Hoover, two American school-teachers employed for three months by the board for the purposes of collecting botanical material, was turned over to me for identification and mounting. It contained 382 numbers, one set of which was mounted and partly identified for the Exposition Board, and one was deposited in the herbarium of this Bureau. All other duplicates were returned to the Exposition Board. The small collection of Dr. Leon Guerrero, 42 specimens, was treated in a like manner. On December 1, 1903, Dr. H. Hallier received a temporary appointment of three months to make botanical collections for the Exposition Board, and the work was placed under my direction. The time occupied by Dr. Hallier was three months, during which period he collected in the Provinces of Laguna and Zambales, Luzon; the Island of Basilan, and the District of Zamboanga, Mindanao, securing, in all, 773 numbers. This material was arranged and the preliminary identifications were made in this office, the final disposition being one set to the Philippine Exposition Board at St. Louis, one to the herbarium of this Bureau, and one retained by Dr. Hallier for the Hamburg Museum, Hamburg, Germany.

In addition to the material from the collections of DeVore and Hoover, Hallier, and Guerrero, 515 specimens, duplicates of my own Philippine collection, were mounted, identified, arranged in families and genera, and sent to the Exposition Board as a portion of the exhibit of this Bureau.

PUBLICATIONS.

During the past year the following papers and botanical subjects have been issued by this Bureau: "New or Noteworthy Philippine Plants, I," and "The American Element in the Philippine Flora" (publication No. 6 of the Bureau).

The first article contains descriptions of eleven new species of Philippine plants, and notes on many others of especial interest; the second is an enumeration and discussion of the many species of plants of American origin now found in the Philippines.

"A Dictionary of the Plant Names of the Philippine Islands" (publication No. 8 of this Bureau) consists of an enumeration of all the known native plant names in use in the Philippines, with their Latin equivalents, this bulletin having been compiled especially for the use of the

employees of the Bureau of Forestry. The following publications have recently been submitted:

"New or Noteworthy Philippine Plants," the second paper of the series, containing the descriptions of 60 new species, and "A Review of the Identifications of the Species Described in Blanco's *Flora de Filipinas*," prepared especially with reference to the identification of Blanco's unknown or imperfectly known species, with the view of aiding collectors in securing material which may assist in the identification of the latter. In addition to the above publications which have been prepared by myself, Dr. E. B. Copeland has submitted for publication a paper entitled "Edible Philippine Fungi, with Diagnoses of New Species." Dr. Copeland at the present time is employed in the investigation of certain problems regarding the growth of the cocoanut tree in relation to the production of copra, and also in the study of Philippine vascular and cellular cryptogams. Dr. Whitford, in conjunction with his work as a collector, is giving special attention to ecological matters, with a view to future publications on the subject, while my own work is very largely of a systematic nature, the present rapid growth of the herbarium making this imperative.

WORK ON THE PHILIPPINE FLORA DONE BY OTHER INSTITUTIONS AND INDIVIDUALS.

The New York Botanical Garden has maintained in the field for nearly a year a collector, Mr. R. S. Williams, who has made extensive and valuable collections in the Provinces of Bataan and Benguet. Dr. H. Hallier, of the Hamburg Museum, in the early part of the past year was in southern Luzon. He then left the Islands and returned later to collect for three months, both for the Philippine Exposition Board and the Hamburg Museum. Duplicates of all of the latter collection are deposited in this Bureau, and arrangements have been made to secure duplicates of the other material. Maj. E. A. Mearns has done some work in Mindanao, his materials having been sent to the United States National Museum, while several school-teachers and other American residents in the Philippines have shown a marked interest in Philippine botany; collecting outfits have been furnished to several and considerable valuable material has already been received from this source.

LAMAO.

At the request of the Chief of the Bureau of Forestry especial attention has been given to the investigation of the flora of the Lamao River basin, Province of Bataan, Luzon, where a reserve for the purpose of investigating the forestry conditions of the Philippines has been established, and at different times during the past year Drs. Copeland, Whitford, and myself have made collections at Lamao, and the same has been done by Messrs. Barnes and Borden of the Forestry Bureau. In the office much time has been given to the identification of this material and a prelimin-

any list of the flora of the Lamao River basin has been supplied the Chief of the Bureau of Forestry for his information.

One of the most important undertakings inaugurated at Lamao is the establishment of the so-called "type areas" at different altitudes in the forest, on plans outlined by me for the Chief of the Forestry Bureau, the work in the field being commenced by Mr. Barnes, and continued by Mr. Borden. These "type areas" consist of typical forest regions of a known size, in which all the trees are labeled and numbered, botanical material being collected from each individual, regardless of its condition as to fruit or flower. After the first collection is made, each tree is examined from time to time until complete material, consisting of fruit, flowers, and leaves, is secured from all. The investigation of these "type areas," if properly carried out, will give us much valuable and interesting information as to the constituents of the Philippine forests, the relative predominance of species of economic importance, the rate of tree growth and reproduction, the periods of flowering, shedding of leaves, etc.

GENERAL RECOMMENDATIONS.

At the present time the botanical work can not be considered as organized, and no definite policy has been adopted regarding its scope or in what direction its chief development should be. There are now seven employees assigned to the botanical work, and in order to avoid confusion it is respectfully recommended that the botanical work be organized as a distinct laboratory, just as is the case with the other laboratories of the Bureau, that a director of the laboratory be appointed, and that he shall have oversight over the other employees in the botanical work, under the general supervision of the Chief of the Bureau.

In order to make the results thoroughly representative the work along certain lines should be developed. The most important subject to be considered is the establishment of a botanical garden under the direction of this Bureau, attention having been called to the importance of such an institution in my previous reports. If it is the plan of this Bureau to attract foreign botanical investigators to this laboratory, it is essential that provision be made for the establishment of a thoroughly equipped and representative botanical garden, for no matter how well the laboratory may be supplied with apparatus, books, and collections, American and European botanists will not select Manila as a locality for their investigations until a thoroughly equipped botanical garden is established as a source from which they can draw material for their investigations. Under proper coöperation it is possible that a satisfactory botanical garden could be developed at Lamao, in connection with the forest reserve, but the question of its accessibility is a very important one. Although the natural conditions are apparently well suited to the purpose, the difficulty of reaching it from Manila is an objection which should be overcome by the acquisition at least of some territory nearer the laboratory.

REPORTS OF PHOTOGRAPHER AND CHIEF CLERK.

The following is the report of the photographer, Mr. Charles Martin, for the period from September 1, 1903, to August 31, 1904:

The total number of prints made during this period is as follows:

5 by 7.....	3,000
8 by 10.....	800
11 by 14.....	400

During February of 1904 the laboratory was supplied with a complete Zeiss photomicrograph camera and apparatus, and since that time a large number of photomicrographs have been taken, some of very great magnification, with very good results. Unfortunately at present the apparatus is placed on a wooden floor, so that some vibration occurs. This defect will be obviated in the new building where it is to be placed upon a stone pier mounted from the ground.

The Civil Hospital having obtained an apparatus which is properly equipped for radiography, about thirty-five skiagraphs were taken during the past year.

The photographer has been on several expeditions outside of Manila. The first of these, to Benguet over the new road, was undertaken in the early months of 1904, and 120 negatives showing the work upon this highway and 28 enlargements of some of these views were made. During the months of June, July, and August the photographer conducted an expedition to northern Luzon for the purpose of photographing the wild tribes of that region. Seven hundred and fifty negatives were taken, 500 of which were developed in the field under the most adverse conditions of weather. Five minor expeditions for the purpose of photographing the methods of rice culture and of threshing were made during 1904.

The negatives of the Bureau of Government Laboratories are now being arranged and sorted and prints from each deposited in an album belonging to the Bureau. After this work is completed the negatives will be numbered and the corresponding number placed upon the print in the album. When this is done the process of finding a giving negative will be much simplified.

Following is the report of Mr. Henry S. Peabody, chief clerk :

Statement of cash received by the Bureau of Government Laboratories during the fiscal year ended June 30, 1904.

Month.	Local currency.	Philippine currency.
1903.		
July	\$1,802.00	₱794.30
August	27.00	28,114.62
September	48.00	70.68
October	205.40	1,290.43
November	135.00	767.31
December	78.00	1,013.12
1904.		
January	9.12	570.10
February	8.84	1,588.61
March	27.68	2,566.23
April	27.84	522.95
May	7.72	222.80
June	5.09	2,576.92
Total	2,381.69	40,098.07

Statement of vaccine virus and rinderpest serum issued to Board of Health during fiscal year 1904.

Month.	Vaccine virus.	Rinderpest serum.
1903.		
July	₱2,379.50	₱4,350.00
August	1,440.74	5,940.00
September	2,156.50	4,665.00
October	1,034.80	8,220.00
November	1,593.00	10,515.00
December	3,455.00	8,585.00
1904.		
January	4,328.00	6,165.00
February	6,741.00	1,125.00
March	6,532.00	1,980.00
April	6,064.00	4,500.00
May	6,944.00	5,175.00
June	4,881.00	8,640.00
Total	47,549.54	69,860.00

Statement of work performed for the various Bureaus of the Government of the Philippine Islands during the six months ended June 30, 1904.

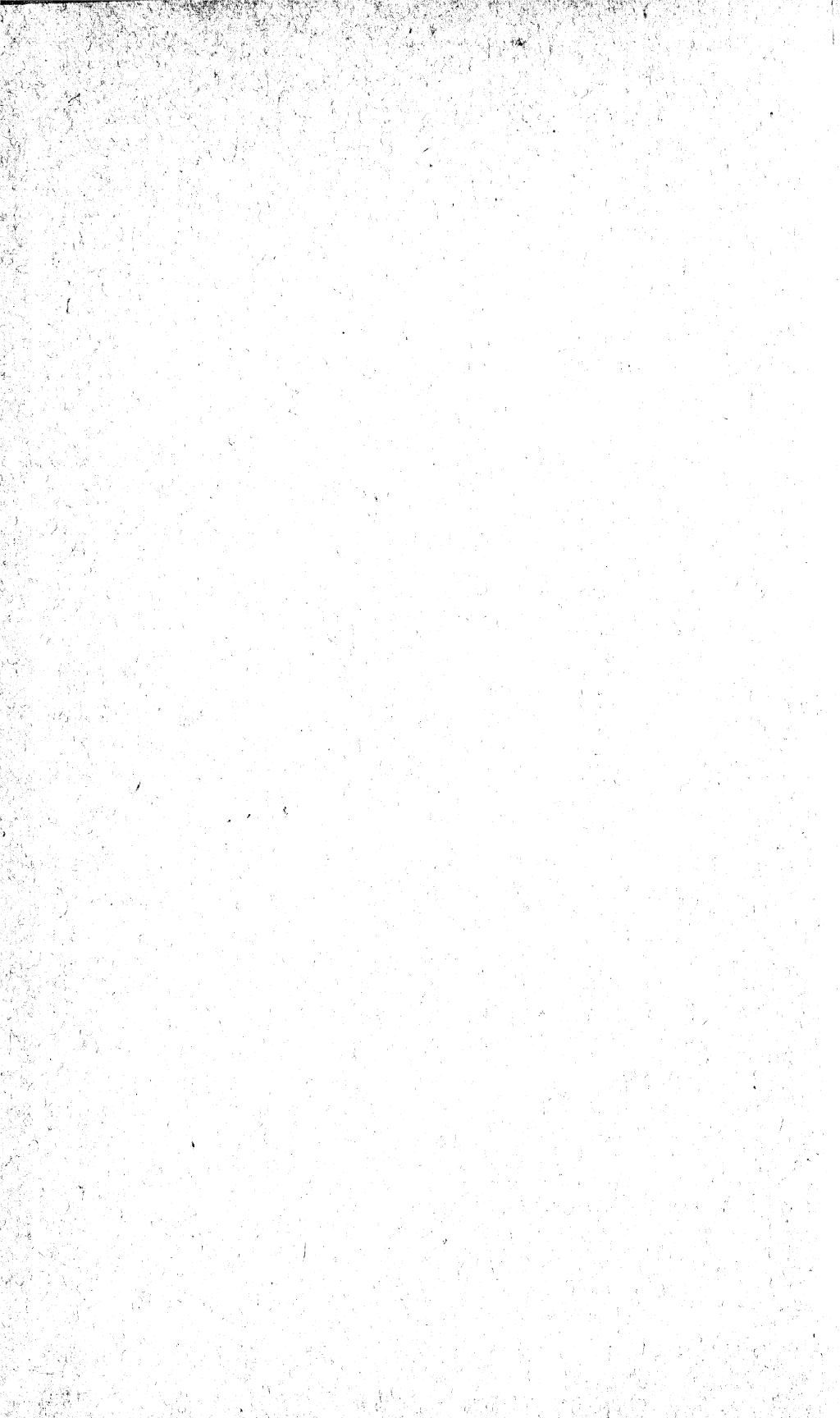
[Amounts stated in Philippine currency.]

Bureau.	January.	February.	March.	April.	May.	June.	Total.
Civil Hospital	P547.00	P719.44	P857.00	P919.00	P771.00	P785.00	P4,508.44
Bureau of Public Instruction	312.00			10.08			322.08
Custom-House	218.00	263.00	295.00	576.50	283.00	225.00	1,840.50
Benguet Road		15.00					15.00
Settlement House			3.00			18.00	21.00
Board of Health	4,670.70	4,535.00	3,493.00	4,871.00	5,058.20	4,054.00	26,681.20
Bilibid Prison	60.00	93.00	387.00	333.00	105.00		978.00
Bureau of Agriculture	22.16	124.32	350.00			30.00	526.48
Mining Bureau		165.00		180.00	160.00	24.00	529.00
Ethnological Survey	140.46	34.00	301.42		2.40		478.28
Forestry Bureau	225.00	60.00	50.00		54.00		389.00
Secretary of the Interior	3.12	8.20	129.00				140.32
Civil Governor	3.12						3.12
Bureau of Architecture	10.00						10.00
Government carabaos	2,695.00	416.00	1,852.00	527.00		267.00	5,757.00
Insular Treasurer		40.00			100.00		140.00
Insular Purchasing Agent		5.00	95.00	50.00	105.00		255.00
Civil Sanitarium			25.00				25.00
Bureau of Engineering				110.00			110.00
Consulting Engineer				30.00			30.00
Coast and Geodetic Survey				5.00	32.00		37.00
Civil Service Board				6.00			6.00
Coast Guard and Transportation					25.00	25.00	50.00
Marine-Hospital and Quarantine						3.00	3.00
Total	8,815.86	6,477.96	7,837.42	7,617.58	6,675.60	5,431.00	42,855.42

Statement of work performed for the various Bureaus of the Government of the Philippine Islands during the six months ended December 31, 1903.

[Amounts stated in local currency.]

Bureau.	July.	August.	September.	October.	November.	December.	Total.
Civil Hospital	\$693.00	\$1,079.00	\$1,046.00	\$1,056.00	\$943.00	\$570.00	\$5,392.00
Exposition Board	323.00				20.00		343.00
Bureau of Public Instruction				15.00	360.00		375.00
Bureau of Public Printing	50.00						50.00
Custom-House	47.00	50.00	67.00	178.00			342.00
Benguet Road	1.00						1.00
Settlement House	3.00		6.00				9.00
Board of Health	4,321.00	6,522.00	4,362.00	5,952.00	4,665.00	3,450.00	29,272.00
Bilibid Prison	38.00	56.00	18.00	84.00	39.00	9.00	246.00
Improvement of the Port						100.00	100.00
Bureau of Agriculture	700.00	1,150.00	3.00	240.00	150.00	360.00	2,603.00
Mining Bureau					90.00		90.00
Ethnological Survey			30.00				30.00
Forestry Bureau				258.00	360.00		618.00
Total	6,181.00	8,859.00	5,532.00	7,783.00	6,627.00	4,489.00	39,471.00



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